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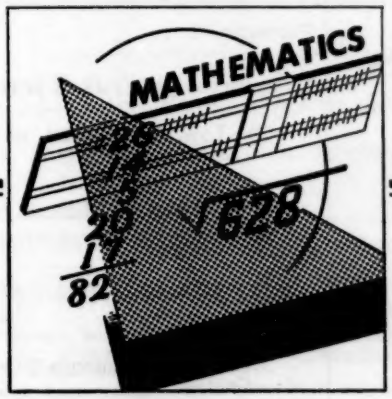

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CURRICULUM PROBLEMS IN THE TEACHING OF MATHEMATICS

The symposium on mathematics consists of contributions by Henry Osner, Instructor in Mathematics and Engineering, Modesto Junior College; Ethel L. Mossman, formerly of Richmond High School; Charles F. Dalziel, Associate Professor of Electrical Engineering, University of California at Berkeley; Harry G. Alway, Instructor, Herbert Hoover Senior High School, San Diego; and Clela D. Hammond, State Chairman of the Curriculum Committee for Secondary Schools and Colleges, California Mathematics Council, and Instructor at El Camino College.

Of general interest to all secondary-school educators are "Cumulative Records in Guidance" by Marian W. Hodge, Superintendent, Whittier Union High School District, and Esther Grace Nolan, Co-ordinator of Research and Guidance, Los Angeles County Schools; "Academic Preparation of Junior-College Personnel" by M. E. Mushlitz, Assistant Chief, Division of Secondary Education, California State Department of Education; and "Accreditation of Schools in California" by Harrison M. Karr, Associate Director of Relations with Schools, University of California at Los Angeles.

IN JANUARY

CURRICULUM PROBLEMS IN LANGUAGE ARTS

CALIFORNIA SOCIETY OF SECONDARY EDUCATION

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CALIFORNIA JOURNAL
OF SECONDARY EDUCATION

◀ January Journal ▶

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CURRICULUM PROBLEMS IN LANGUAGE ARTS

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New Books

PUBLICATIONS sent to the JOURNAL office recently for review include the following books and pamphlets:

BAYLES, ERNEST E., and MILLS, ARTHUR L. *Basic Chemistry for High Schools.* New York 11: The Macmillan Company, 1947. Pp. xii + 720. $3.00.

CARR, WILLIAM G. *One World in the Making* (second edition). Boston 17: Ginn & Co., 1947. Pp. v + 114. $1.20.

CASIS, LILIA M.; SWITZER, REBECCA S.; HARRISON, SALOMAY L.; and WOOLSEY, ARTHUR W. *El Mundo Espanol* (third edition). Boston 16: D. C. Heath & Co., 1947. Vol. I—Pp. xviii + 509. Vol. II—Pp. xvi + 499. $2.60 each.

FENTON, CARROLL L., and KAMBLY, PAUL E. *Basic Biology for High Schools.* New York 11: The Macmillan Company, 1947. Pp. x + 726. $3.24.

GOLDBERGER, I. H., and HALLOCK, GRACE T. *Health and Physical Fitness.* Boston 17: Ginn & Co., 1947. Pp. x + 596. $2.32.

GOODMAN, KENNARD E., and MOORE, WILLIAM L. *Economics in Everyday Life* (revised edition). Boston 17: Ginn & Co., 1947. Pp. vi + 576. $2.40.

GUILD, BRUCE H. *Sprouting Your Wings.* Prepared for the Committee on Experimental Units of the North Central Association of Colleges and Secondary Schools. New York 18: McGraw-Hill Book Co., 1947. Pp. vii + 114. $1.32.

KENISTON, RACHEL P., and TULLY, JEAN. *Plane Geometry.* Boston 17: Ginn & Co., 1947. Pp. viii + 392. $1.96.

KILPATRICK, WILLIAM H.; VAN TIL, WILLIAM (ed.). *Intercultural Attitudes in the Making.* Ninth Yearbook of the John Dewey Society. New York 16: Harper & Bros., 1947. Pp. ix + 246. $3.00.

KIELY, RAYMOND R. *Surveying Instruments—Their History and Classroom Use.* Nineteenth Yearbook of the National Council of Teachers of Mathematics. New York: Bureau of Publications, Teachers College, Columbia University, 1947. Pp. xiii + 411. $3.00.

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NEXT ISSUE

THE January issue presents a symposium on curriculum problems in the teaching of the language arts. The major contribution will be the highlights of the recent national convention of the National Council of Teachers of English in San Francisco on November 26-29, in which California teachers played an important part both as hosts and as participants.

JOURNAL readers will also be interested in the articles by Henry C. Meckel, Supervisor of the Teaching of English, University of California at Berkeley, in which he discusses what should be done to improve the teaching of English in the secondary schools of California; in the contributions from Fullerton Junior College, describing the sound studio there; in the report on curriculum planning in Los Angeles City Schools by Thelma Barnes, Girls' Vice Principal, San Pedro High School; and in "Time for the Three R's," which reports the findings in the recent curriculum study conducted by the State Department of Education and Stanford University in the use of periodicals in teaching English.

The foreign-language contribution to the symposium is a discussion of what is happening to foreign languages in California teacher-training institutions. Written by Walter V. Kaulfers, Stanford University, the article summarizes a survey of college practices, as listed by Robert Fitch, Occidental College; Walter P. Phillips, San Diego State College; Guy B. Colburn, Fresno State College; May E. Williams, Chico State College; Louis Mongnió, Mills College; Clair H. Bell, University of California at Berkeley, and B. Q. Morgan of Stanford University. Later issues of the JOURNAL will publish a series of articles on what is happening to foreign languages in the secondary schools.

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By T. L. Engle

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California Journal of Secondary Education

Vol. 22 DECEMBER, 1947 No. 8

A Realistic Philosophy For Teachers

TODAY, we have special need of a philosophy that can help us face, or at least contemplate, the future. We are living in a timid and negative and in many respects reactionary period. Many of our social and political leaders seem to be floundering with little purpose except to serve their own ends; we, the public, have little initiative and seem to act only under the stress of an extensive advertising campaign. There is a sensational, melodramatic frame of mind about that lets our publicists, and even some responsible leaders, talk loosely of war without counting the effects of their words. It is not that they want war but that the ideal of "peace" was too easily assumed. They forgot, as we all forgot, the cost and the dangers of peace, which are more certain and more pervasive and more constant than those of war—and are not the breadth of an ocean away. We cannot plan just to wage war or to avoid it but could plan many of the myriad details of simple day-to-day living if we had the vision.

Social questions at home show the same emotional state of mind and the same reactionary tendency. The more prosperous and conservative class are scared of losing their control and are following a short-sighted policy of making what they can now; the less-well-off live in fear of recurrent hard times—if not under more immediate pressure. Those of us in the middle are at least uncertain and look around before we speak. The persecution of ideas is not so brutal as it was after the first world war—there is no A. Mitchell Palmer, and we can believe there will not be another Sacco-Vanzetti tragedy. But there is enough suspicion and friction to keep people from getting together on important matters.

There is a reactionary trend in the intellectual world, too—and there is not the ferment of the early 20's to counterbalance it. As always, education feels the general social pressure. The gains of "progressive education" are being tossed out along with its unhappy features. Courses are planned, especially in the colleges, by pressing the button that releases a group of classics without regard to their appropriateness for the time or for young people. Even the old battle cry of "More grammar!" is raised. At the same time, of course, the main line of development in our work goes steadily on. But the clash of differing aims and means of approaching them is certainly not less than usual and seems to be somewhat more intense.

In such a period, the opposite sides tend to line up as "conservative" or

This editorial is an excerpt from the President's Address to the Thirty-Seventh Annual Meeting of the National Council of Teachers of English in San Francisco on November 26-29. Dr. Porter G. Perrin, President of the National Council for 1947, is Professor of English, University of Washington.

"radical," general emotional patterns that lead to action without considering the full merits of the question. Can we raise the part of the general struggle that comes within our professional purview above this emotional level? The best way I see is to become more conscious of and more active in a naturalistic philosophy. Representatives of the other traditions of belief also say that the time needs their ministrations. I believe they are disqualified by the nature and remoteness of their ideals and the difficulty of making contact with concrete problems, especially with the problems of young people.

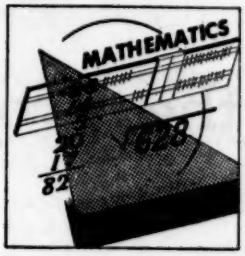
SHIFTING the center of our fundamental beliefs will not work a miracle. But facing squarely people as they are at their best and discovering ways of helping more to see this plain human ideal may accomplish much. The first step is taking human nature calmly, naturally. Judged against ultimate ideals, it leaves much to be desired. Judged against the background of its evolution, it also leaves much to be desired, but also shows a line of hope for future development. Our traits, our weaknesses even, are not a falling from grace—though the old theology still pursues us—but a natural growth from even lower forms. We don't see a clear advance but a hitching along of individuals, and the individuals make the race. We can't make over the race, but we can occasionally contribute to the individuals.

This task will require patience and a long-range view and a faith that our efforts will bring some reward—not a revolution or a reformation or a millenium, but a further step in the line of natural development. I believe a more naturalistic "emphasis of attention" would serve as a counterbalance to emotion, and a more realistic faith will help us to solve more of our professional problems, help us deal more adequately with our materials, and face our pupils at all levels with more confidence and with more hope of helping them today and perhaps tomorrow.

Making Arithmetic Useful

"What uses for arithmetic have the typical child and the typical adult? Attempts, none of them successful, have been made to answer this question through research. Commonly the uses reported have mirrored the effects of incomplete learning. Individuals, children and adults alike, who have never mastered the essential ideas and processes of arithmetic and who have studied the subject in the vacuum of the arithmetic class period,—such individuals are hardly competent to tell us much about the *potential* uses of an arithmetic that has been properly acquired. The 'needs for arithmetic' reported for children in the lower grades have, however, demonstrated unmistakably one important fact; namely, that such 'needs' follow rather than precede the learning of arithmetical concepts and skills.

"We shall have confident knowledge about the possible contributions of arithmetic to life only when research can be done with subjects (children and adults) who have had the benefit of the right kind of instruction. In the meantime it is worth while to collect evidence to show how properly learned arithmetical ideas and skills constantly enrich the learner's life by furnishing better controls over his environment, by giving rise to new 'needs.' And it is worth while to list for teachers possible opportunities in the classroom, and outside it, in which children may be led to use the arithmetic they learn."—William A. Brownell, *Duke University*, in Journal of Educational Research, Vol. xl, No. 5 (January, 1947), p. 377.



CURRICULUM PROBLEMS IN MATHEMATICS

This issue features a symposium on curriculum problems in the teaching of mathematics. Clela D. Hammond, State Chairman of the Curriculum Committee for Secondary Schools and Colleges, California Mathematics Council, and Instructor, El Camino College, reviews junior-college mathematics offerings in California; Henry Osner, Instructor in Mathematics and Engineering, Modesto Junior College, proposes a survey course in mathematics; Harry G. Alway, Teacher, Mathematics Department, Herbert Hoover Senior High School, San Diego, describes the San Diego curriculum project in mathematics; and Edith L. Mossman, formerly of Richmond High School, suggests a mathematics program for the elementary school, as preparation for work in the secondary schools. For secondary-school educators who are counseling students in selecting careers requiring mathematical aptitude and training, Charles F. Dalziel, Associate Professor, Division of Electrical Engineering, College of Engineering, University of California at Berkeley, reviews the professional opportunities in electrical engineering. Notes on books and research, together with relevant excerpts, complete the symposium.

Other articles scheduled for this symposium will appear in forthcoming issues of the JOURNAL. Among these is the article on the need for arithmetic in the junior college, as presented by Thomas J. Bass, Head, Mathematics Department, San Francisco Junior College. In his contribution, Mr. Bass not only describes the arithmetic program offered by his institution but also summarizes the results.

●

The Fundamentals of Mathematics

"There is little justification in considering the fundamentals of mathematics before making a fair appraisal of the place of this area of study in the hierarchy of subject fields which comprise the major learning experiences. As a subject it has long occupied a position of prominence in the list of required experiences. As a field of study it often has been victimized by an isolationist attitude on the part of its masters. Occasionally it has flourished abortively at the hands of faddists and non-masters of its thorough techniques and its possible genuine contribution to complete and successful living. If mathematics has failed to make a vital contribution to the life experiences of all people, it is because its school vendors lost both insight and foresight. Mathematics as a vehicle of successful living in modern society has lost none of its inherent, vital qualities."—GLENN G. EYE, *University of Wisconsin*, in THE NORTH CENTRAL ASSOCIATION QUARTERLY, Vol. XX, No. 2 (October, 1945), p. 175.

The Law, the Prophets, and Geometry

By HARRY G. ALWAY

A classroom experiment in teaching geometry at Herbert Hoover High School, San Diego, California.

Testimony of Some Witnesses

Plato (360 B. C.): *"No other tool except the compass and ruler shall be used to solve a problem in geometry."*

•

Pascal: *"To prove a theorem in geometry is to think like God."*

•

Teacher (to her students): *"An axiom is a statement which is true to anyone of sound mind."*

•

Durant: *"Women and children still crave absolutes."*

•

John Dewey and Einstein: *"There are no absolutes."*

•

Navigator: *"The theorem of Pythagoras is true only when small areas of the earth are considered."*

•

Mathematician: *"The axioms and theorems of geometry are true only under special conditions."*

•

University of Chicago Research in Problem Solving: *"Problem solving does not move in the direction of the classic proof of a geometric theorem."*

•

Rule of reasoning: *"Pure logic is a trap for fools unless one learns to examine the first premise."*

•

Old Grad: *"No, I have never used geometry since graduating. Truth is, I did not catch on, but Mr. Smith was kind, and I memorized enough to get by."*

Harry G. Alway, Teacher of Mathematics, Herbert Hoover Senior High School, San Diego, who has been with the San Diego schools for twenty-one years, contributes the article in the symposium concerning mathematics in the high school. T. Malcolm Brown, Director of Instruction, San Diego City Schools, says of the author: "Mr. Harry G. Alway is one of those jewels of the teaching profession whose sparkling brilliance — like the diamond's — is caused by depth and by studied refraction. The rays of light and hope that he introduces into a geometry class strike the most amazing facets. During the experiment last year, he stated it was the first time in his teaching career that he had a non-failure program; that although he arrived at school at 7:00 a. m. and earlier and often worked Saturdays, it was the first year he could leave school Friday afternoons without stomach ulcers. We need a few more Mr. Always in the profession."

THE curriculum project in San Diego offered me time off from teaching to attempt to remove some of the stingers in algebra. I found it stubborn and unyielding—its mechanics, unassailable. Turning to geometry, I found it spoiling for a change. It has descended virtually unchanged from such founding fathers as Plato and Euclid. Its disembodied logic was stylish in the court of Ptolemy, with the

medieval schoolmen, and with the prep schools of even date. As an excluder from college, its power of divination still separates the sheep from the goats. But the spectacular and practical successes of the non-Euclidian systems have dispelled its aura of absolute truth.

Splitting the atom cracked geometry. No conscientious teacher can now ask his students to accept, without proof, its opening axioms and postulates. This change calls for a reorientation of high-school geometry toward science, engineering and technology, and the broadening of its cultural base with due regard for the sixteen-year-old mind.

WHY PRESERVE GEOMETRY?

The foregoing statement is not intended as an argument for the elimination of geometry. Far from it. In addition to supplying me a job, there remain all the important ideas of form, measurement, spacial concepts, reasoning, classification, definition, problem solving, and mathematical insight. Geometry presents the first opportunity to apply algebra in meaningful situations, justifying on-the-spot reteaching of algebra. It can and should teach the over-all reasoning employed by science, a thing frequently lost in a welter of unrelated facts in our science courses. There is also the opportunity to introduce practice in the tools of technology, such as the slide rule and transit.

ECONOMY OF TIME

Recent textbooks with fewer ideas and interminable exercises have resulted in much dawdling and waste of time on the premise that you can cure an allergy with massive doses of the offending irritant. In my youth, we learned both plane and solid geometry in eight months of thirty-minute periods; now, we consume double the time with double-length periods. Only thirteen theorems are used in higher mathematics; their methods of proof, almost never. Geometry now represents the last formal course in mathematics for most students. It should be more than a rule-of-thumb classic.

TINKERING WITH GEOMETRY

The general mechanics of our plan in San Diego might be applied to any course, and often is. We worked out 160 daily units, each having thirty minutes for discussion and thirty minutes for written work, to be handed in then and there. Each unit was hand-tailored to the age, ability, and working time of the class and was unified about a central theme. The written work began with many easy steps, but ended in a challenge to the best. Although no textbook assignments were made, students usually carried their textbooks about for reference and storage.

Proving a theorem from the textbook is like telling a joke with complete directions about when to laugh. In our plan, some student with an illuminated face will spring forward, giving a proof and telling us how he hit upon the solution. Thus, the customary two weeks of dawdling over quadrilaterals is tied together in thirty minutes of proofs with thirty minutes left to write implications and applications. Life being what it is, that's enough for quadrilaterals. Patently, many daily units are reviews. The threat of ensuing written work in the same period usually keeps interest at white heat.

SAMPLES

What do we do with the time saved? Paradoxically, we put back in the course some units which modern texts omit. Among these were units on maxima, minima, and symmetry, to which we gave a purely intuitive treatment. On Hallowe'en, we gave a unit to test the superstition I. Q., followed the next day by a unit on the reasoning of science.

The unit on gambling comes at the opening of the racing season. (The aim is necessarily limited to saving money—not souls.) Field day with the transit goes with Surveyor Washington's birthday. Columbus Day gives a unit on navigation. Christmas-tide is a natural for the study of incommensurables as typified in calendar construction.

The unit on syllogisms and hidden assumptions proved that this supposedly college-level reasoning is easier for a tenth-grader than the traditional proofs of theorems. It has more relation to reality. Two units on the slide rule were popular and provided something new in the fad of interminable explanations of the decimal system. Some units were designed to use algebra to, and including, quadratics; others reviewed arithmetic fundamentals. A unit in optical illusions had applications in design.

Many units were designed to permit the student to discover the geometric laws by inductive reasoning with the aid of numerous crude sketches. Unit No. 1 was built around the theorem that the sum of the angles of any triangle is 180 degrees, thus relating the new subject to the familiar number system and postponing the fiction of rigorous proof to the second month.

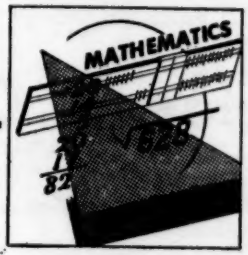
After the first month, we formed a mathematics club whose members concentrated on the most difficult problems available and, with attendant honors in the school paper, accorded the best solutions.

LAZY STUDENTS

The author's attitude toward lazy students has been modified by several vacations spent among well-adjusted primitive societies. Among these, lazy youth simply do not exist. Our working hypothesis is that the lazy student in mathematics finds the work too difficult or fails to relate it to real life. Moreover, clever commercialized distractions overstimulate him in after-school hours. Failure warnings are the poorest correctional device. It is better to adjust the course so that students can have some feelings of success. Mathematics for the élite is proper at the college level, but where community and parental pressure is causing half the school enrollment to take geometry, is not the proper procedure an adjustment toward the norm of this group? The purist will say "No." He would have all his students composers, but composers are rare. Most are fitted for appreciation or, at best, reproduction.

The choice is a difficult one. A change from hallowed tradition will incur the accusation of dilution of learning and could so result. We do not maintain that our plan is a panacea, but we offer it as a working philosophy.

IN summarizing, it should be noted that these first units were not always successful, in which case the blame fell squarely on the teacher. Five per cent of the original enrollment were asked, but not compelled, to drop the course as a result of low grades in the prognostic test which is given on the first day. In the best-known experiment of this kind at Ohio State, students who also did work in nongeometric reasoning did as well, or better, in final examinations as those confined to the traditional course. Although we had no control groups in San Diego, our results bore out this thesis. In the Standard Co-operative tests, our 120 students stood well above the national average, and none failed. However, this situation seemed unimportant compared with the improved relations and improved mental health of all concerned.



New Mathematics Courses

"The existing mathematical sequence is quite satisfactory for future engineers, scientists, professional men and women, research workers, and for all those pupils who plan to go to college. As time goes on, these courses will be further improved to fit the changing needs. However, many educators feel that high-school mathematics courses are open to objections when examined from the point of view of a large percentage of the pupil population. These educators contend that the mathematics courses do not appeal to the pupil who is not planning to enter college, that the courses contain an abundance of materials for which people in general have little or no use, that the courses are too difficult when compared with other subjects, and that the courses are disliked by many pupils.

"The solution of the curriculum problem seems to lie in the development of a second course in mathematics for pupils who are not taking the traditional courses....

"Though the new courses are being planned for the pupils who are not in the traditional courses, they should not be regarded as an inferior substitute. They are to be taken by college and non-college pupils, by gifted and by slow pupils. They should comprise the fundamentals of arithmetic, a knowledge of informal geometry, the basic elements of algebra, numerical trigonometry, and graphical representation. The subject matter selected is useful to people in everyday life and places much emphasis on social problems. The new courses are being related to the pupil's experiences in school and to the experiences that he may expect to meet later in life.

"High proficiency in the manipulative skills of arithmetic and algebra is to be developed in the new courses. However, stress is to be laid on understanding and real learning rather than on memorizing. Thus it is the aim of the new course to provide all pupils who graduate from high school with a good knowledge of arithmetic. In attaining this goal, however, educators must realize that some aspects of arithmetic have been found too difficult for the younger pupils and should, therefore, be deferred to the high school. In fact, difficulties, in general, are to be greatly reduced, although the reduction of difficulties does not mean that everything the pupil finds hard is to be kept from him, since that could not be considered the best preparation for future citizenship. Rather, the difficulties are to be reduced through the greater use of illustrative materials, through direction of the pupils' studying, through the provision of more time for assimilation, and through improved teaching technique. Much attention will need to be given to the development of good habits of work and study and to training in correct thinking and logical reasoning. The new courses, therefore, should satisfy the vocational needs of the large mass of pupils. It is evident that all this work cannot be crowded into the brief period of a one-year course. Some mathematical instruction will have to be part of each year's work of the high-school program.

"The problem of teaching and administering the course is indeed a difficult one. It will require the joint efforts of teachers and administrators and often the co-operation of teachers of related subjects and thus will become an enterprise of the school staff. Furthermore, national organizations and committees can make recommendations, but no matter how excellent the recommendations may be, they will be ineffective and fail to approach anything like country-wide adoption unless the teachers of mathematics have the encouragement and co-operation of the administrators of their school."—E. R. Breslich, *Associate Professor Emeritus of the Teaching of Mathematics, University of Chicago,* in The School Review, Vol. lv, No. 1 (January, 1947), pp. 36-37.

Mathematics in California Junior Colleges

By CLELA D. HAMMOND

As junior colleges become aware of their responsibility for providing training both for college-preparatory and terminal students, instructors of mathematics in these institutions are concerned about their offerings. In order to appreciate a discussion of the types of courses which should be offered, JOURNAL readers must first know which courses are being given at the present time.

Clela D. Hammond, Instructor of Mathematics, El Camino College, summarizes the present-day offerings in forty California Junior Colleges. As State Chairman of the Curriculum Committee for Secondary Schools and Colleges, California Mathematics Council, Miss Hammond is very much interested in curriculum development in the field of mathematics.

As a basis for organizing new courses or for evaluating those already offered, it is important for a school to study the offerings which are given in other institutions. Therefore, the junior college that is interested in meeting the needs of its students in the field of mathematics must take time now and then to take stock of the courses that are offered elsewhere.

The survey of mathematics courses offered in the public junior colleges in California which is reported in this article was based upon a study of mathematics courses listed by the forty junior colleges listed below.

Group A. Junior Colleges Maintained by Junior-College Districts

1. Chaffey
2. Compton (grades 11-14)
3. Fullerton
4. Glendale
5. Long Beach
6. Los Angeles
7. Marin
8. Modesto
9. Mount San Antonio
10. Pasadena (grades 11-14)
11. Riverside
12. Sacramento
13. San Bernardino
14. San Mateo
15. Santa Ana
16. Santa Rosa
17. Yuba (grades 9-14)

Group B. Junior Colleges Maintained by High-School Districts

18. Antelope Valley
19. Bakersfield
20. Brawley
21. Central
22. Citrus
23. Coalinga
24. Lassen
25. Napa
26. Oceanside—Carlsbad
27. Placer
28. Porterville
29. Reedley
30. Salinas
31. San Benito
32. San Francisco
33. San Luis Obispo
34. Santa Maria
35. Santa Monica
36. Stockton
37. Taft
38. Vallejo
39. Ventura
40. Visalia

Data for this study were secured from the catalogues published by the junior colleges listed. (In each case, the catalogue used was the most recent one available in 1947 at the University of California in Berkeley.)

COURSES OFFERED

In the forty junior colleges studied, a total of 446 mathematics courses are offered, the range being from 5 to 19 courses with a median of 11 courses as shown in Table I.

TABLE I—MATHEMATICS COURSES OFFERED IN 40 PUBLIC JUNIOR COLLEGES IN CALIFORNIA (1945-1947)

No. of Courses Offered	No. of Junior Colleges Offering These Courses		
	Group A	Group B	Total
19	1	0	1
18	2	0	2
17	1	1	2
16	1	0	1
15	2	1	3
14	2	2	4
13	1	4	5
12	0	0	0
11	3	2	5
10	1	3	4
9	0	2	2
8	1	1	2
7	0	2	2
6	2	4	6
5	0	1	1
Total No. of Colleges	17	23	40
Range in Number of Courses Offered	6-19	5-17	5-19
Median Number	14	10	11

The enrollment of the junior college is a factor in the number of courses offered, but this survey is not concerned with that relationship. The table does indicate that those junior colleges in Group A offer about four more courses based on the median than those in Group B.

These 446 different courses are classified by their common name in Table II. In order to prevent misunderstanding, the totals are not entered in Table II. For example, Mathematics 3A and Mathematics 3B (Analytical Geometry and Differential Calculus) could be offered as Mathematics 3A-3B, a year course, counting as one course offered; or if listed as Mathematics 3A and Mathematics 3B (separate semester courses), it was counted as two courses offered in Table I. However, in Table II, in either case it would be counted only once as the subject offered.

FINDINGS

By analyzing Table II, we find the following offerings in mathematics:

1. Only one junior college does not offer analytic geometry and calculus.
2. Ten junior colleges do not offer college algebra.
3. Three junior colleges do not offer intermediate algebra; yet five junior colleges offer both second-year algebra and algebraic theory.
4. Three junior colleges do not offer trigonometry, and fifteen colleges offer a separate course in spherical trigonometry.
5. Nine junior colleges do not offer plane geometry, and eleven do not offer elementary algebra.
6. Two-thirds of the junior colleges offer mathematics of finance.
7. Three-fourths of the junior colleges offer solid geometry.
8. Nearly three-fourths of them offer advanced analytic geometry and integral calculus.
9. Less than one-half (47½ per cent) offer a course in basic or general mathematics.
10. Less than half (42 per cent) offer a third year in advanced engineering mathematics.
11. Thirty per cent offer courses relating to mathematics for industry.
12. One-fourth of the junior colleges offer a course in the slide rule.
13. One-tenth (or four) of the junior colleges offer a course in descriptive geometry.
14. One-tenth (or four) offer a course in vector analysis.
15. Surveying is offered in three schools.
16. Statistics is offered in two schools.
17. Arithmetic is offered in two schools.

TABLE II—MATHEMATICS COURSES OFFERED IN JUNIOR COLLEGES

Name of Course	No. of Junior Colleges Offering the Course		
Elementary Algebra	16	13	29
Plane Geometry	16	15	31
Basic Mathematics (General Mathematics)	8	11	19
Intermediate or Second-Year Algebra	17	20	37
Plane Trigonometry	15	18	33*
Spherical Trigonometry	8	7	15
Plane and Spherical Trigonometry (one course)	1	3	4*
**Algebraic Theory	4	1	5
Solid Geometry	12	17	29
Analytic Geometry—Differential Calculus	16	23	39
Advanced Analytic—Integral Calculus	11	17	28
Third Course—Calculus	5	4	9
College Algebra	15	15	30
Vector Analysis	4	0	4
Mathematics of Finance (Mathematics—Investment)	16	11	27
Advanced Engineering Mathematics (4th Calculus)	12	5	17
Mathematics for Industry	5	7	12
Slide Rule	4	6	10
Descriptive Geometry	2	2	4
Solid Geometry and Determinants	2	1	3
Surveying	1	2	3
Statistics	2	0	2
Arithmetic	0	2	2
Other Courses	4	8	12

* Combining the two plane trigonometry and plane and spherical trigonometry, 37 schools offer a course in plane trigonometry.

** Listed separately, for the schools offered also second-year algebra, as well as college algebra.

In Table II, there were twelve courses listed as other courses. These are unique, as the college offering each course is the only college to offer such a course. However, if more were known about the course, some of them might have been included with the previous classifications. The other courses include one course each in pure projective geometry, computational trigonometry, mathematics for nurses, mathematics for science, mathematics for electricians and radio men, mathematics for the elementary school, basic vocational mathematics, meaning of mathematics, mathematics analysis, special readings in mathematics, mathematics for aviation, and mathematics of business.

IDENTIFICATION OF COURSES

The survey of the identification of the courses is limited only to those ten courses that may be offered in college—namely, elementary algebra, plane geometry, advanced algebra, plane trigonometry, solid geometry, college algebra, analytic geometry and calculus, advanced analytic geometry and integral calculus, mathematics of finance, and the slide rule.

Elementary Algebra (offered 29 times)

7 times as Mathematics A
7 times as Mathematics 51
4 times as Mathematics 50
2 times as Mathematics X
1 time each as Mathematics 1, B, 30, 41, 53, 54, Y, 21, 71

Plane Geometry (offered 30 times)

7 times as Mathematics 52
6 times as Mathematics B
3 times as Mathematics 51
2 times each as Mathematics 50 and Mathematics Y
1 time each as Mathematics C, A, 30B, 40, 50, 53, 63, X, 72, 104A

Intermediate Algebra (offered 37 times)

12 times as Mathematics 1
11 times as Mathematics D
2 times as Mathematics A and as Mathematics 51
1 time each as Mathematics B, 1D, E-5, E, 1A, 3A, 21, 31, 54, 112A

Plane Trigonometry (offered 33 times)
21 times as Mathematics C
2 times each as Mathematics 2, 3, 51
1 time each as Mathematics 5, 32, 20C, 50, 52, 114A

Solid Geometry (offered 29 times)
9 times as Mathematics E
7 times as Mathematics G
2 times each for Mathematics C, 4
1 time each as Mathematics D, 20E, F and 4, 5, 24, 30-50B, 501, 531, 114B

College Algebra (offered 29 times)
13 times as Mathematics 8
10 times as Mathematics 1
1 time each as Mathematics 1b, 2d, 21, 33, 55B, 58

Analytical Geometry and Differential Calculus (offered 39 times)
27 times as Mathematics 3A-3B
1 time each as Mathematics 3-4, 7A-7B, 11-12, 23A-B, E25A-B, 30A-B, 36-37, 53A-B, 54A-B, 61A-B, 126A-B, 136

Mathematics of Finance or Mathematics of Investment (offered 27 times)
19 times as Mathematics 2
3 times as Mathematics 22
1 time each as Mathematics 5, 9, 33, 38, 62A-B

Slide Rule (offered 10 times)
2 times as Mathematics 19, 1 time as 19A
1 time each as 6, 20, 40, 51, 57, 69, 67

Advanced Analytical Geometry and Integral Calculus (offered 30 times)
20 times as Mathematics 4A-4B
1 time each as Mathematics 5-6, 6A-B, 14A-B, 24A-B, 31A-B, 32A-B, 45-46, 55A-B, 44A-B, 136B

A summary of the most-frequently-used numbers indicates the following practices:

Elementary Algebra	Mathematics A or 51
Plane Geometry	Mathematics B* or 52
Intermediate Algebra	Mathematics D* or 1
Trigonometry	Mathematics C*
Solid Geometry	Mathematics E or G*
College Algebra	Mathematics 8 or 1*
Analytic Geometry—Differential Calculus	Mathematics 3A-3B*
Advanced Analytic—Integral Calculus	Mathematics 4A-4B*
Mathematics of Finance	Mathematics 2
Slide Rule	Mathematics 19

*Same designation as the University of California Summer School, 1947.

CREDIT VALUES

Elementary Algebra. As a year course, only four colleges in Group B and none in Group A offer elementary algebra. As a year course, the students receive from 3 units per year to 10 units of credit for the course for class hours ranging from 8 to 10 per year, or 4 and 5 each semester.

As a semester course, six junior colleges designate elementary algebra for Semester I only; and eleven for either semester; and for the others, no mention is made of the semester in the catalogue. As a semester course, the unit values range from 0 to 5 units of credit with:

16 schools	3 units	(hours not listed)
3 schools	3 units	(5 class hours)
3 schools	0 units	(hours not listed)
2 schools	5 units	(hours not listed)
1 school	5 units	(5 class hours)
1 school	4 units	(5 class hours)
1 school	2 units	(2 class hours)

As a one-year course, five colleges in Group B offer geometry, with credits ranging from 3 units per year for 10 class hours to 8 units per year for 10 class hours.

2 schools	1½-1½ units	(5-5 class hours)
1 school	4 -4 units	(5-5 class hours)
1 school	2 -2 units	(5-5 class hours)
1 school	2 -2 units	(hours not listed)
1 school	3 -3 units	(hours not listed)

As a semester course, four schools designate Semester II only; seven designate either semester; and one, Semester I only.

15 schools	3 units	(hours not listed)
3 schools	3 units	(5 class hours)
2 schools	5 units	(hours not listed)
2 schools	0 units	(hours not listed)
1 school	5 units	(5 class hours)
1 school	4 units	(5 class hours)
1 school	2 units	(hours not listed)

As a year course, seven colleges (one in Group A with 3-3 units and six in Group B) offer from 3 to 8 units of credit.

2 schools.....1½-1½ units (5-5 class hours)
1 school.....1½-1½ units (hours not listed)
1 school.....2 -2 units (5-5 class hours)
1 school.....4 -4 units (5-5 class hours)
1 school.....3 -3 units (hours not listed)

As a semester course, four junior colleges designate Semester I, and ten designate either semester. The credit values range from 3 to 4 units for 3-5 class hours.

23 schools.....3 units (hours not listed)
3 schools.....3 units (3 class hours)
4 schools.....3 units (5 class hours)
1 school.....4 units (hours not listed)

Trigonometry. Trigonometry is a semester course in all of the junior colleges. Three of them indicate Semester I; five, Semester II; and thirteen schools, either semester.

23 schools.....3 units (3 class hours)
8 schools.....3 units (5 class hours)
3 schools.....2 units (hours not listed)
1 school.....5 units (hours not listed)

Solid Geometry. Solid Geometry was offered only as a semester course, five schools designating Semester I; seven schools, Semester II; and seven schools, either semester.

15 schools.....2 units (2 class hours)
2 schools.....2 units (5 class hours)
7 schools.....3 units (3 class hours)
5 schools.....3 units (5 class hours)
1 school.....5 units (hours not listed)

College Algebra. As a year course, only one college in Group B offers it with credit values of 2-2. As a semester course, four schools designate Semester I; four, either semester; and seven schools, Semester II.

28 schools.....3 units (3 class hours)
2 schools.....3 units (5 class hours)

Analytic Geometry and Differential Calculus. Each part may be offered as a separate semester course, or the two together as a year course; but in either case, in all 39 schools, each semester was granted three units.

Advanced Analytic and Integral Calculus. The statement made above regarding granting units by the semester will also hold true in the advanced course. However, the units and hours per semester vary as shown below.

19 schools.....3 units (3 class hours)
2 schools.....2 units (2 class hours)
1 school.....4 units (hours not listed)
4 schools.....3 units (hours not listed)
1 school.....3 units (5 class hours)

Mathematics of Finance. One school offers this course as a year course with units 3-3. As a semester course, one school offers it during Semester I; two schools, during Semester II; and four schools, during either semester.

24 schools.....3 units (hours not listed)
1 school .....1½ units (hours not listed)

Slide Rule. Slide Rule is a semester course in all schools which offer it. Five schools state either semester; and one school, Semester II only. In all ten schools, the course is for one unit for one class hour per week.

TABLE III—MATHEMATICS COURSES WITH UNIT VALUES OF MOST FREQUENT PRACTICE

Course	How Offered	Units	Class Hours	No. of Schools Using Practice
Elementary Algebra	Semester	3	3	19
Plane Geometry	Semester	3	3	15
Intermediate Algebra	Semester	3	3	23
Plane Trigonometry	Semester	3	3	23
Solid Geometry	Semester	2	2	17
College Algebra	Semester	3	3	28
Analytic Geometry—Differential Calculus	Year	3-3	3-3	39
Advanced Analytic—Integral Calculus	Year	3-3	3-3	19
Mathematics of Finance	Semester	3	3	24
Slide Rule	Semester	1	1	10

SUMMARY

A summary of the most frequent practice of granting units and the number of class hours is shown in Table III, which also indicates the number of schools among the forty surveyed that employ that method.

CONCLUSIONS

1. Students with deficiencies in high-school algebra and plane geometry have an opportunity to clear them in most of the public junior colleges in California.

2. There is a lack of uniformity of numbering the mathematics courses, but there is general agreement on listing trigonometry as Mathematics C, analytical geometry and differential calculus as Mathematics 3A-3B, and advanced analytics and integral calculus as Mathematics 4A-4B, and Mathematics of Finance as 2.

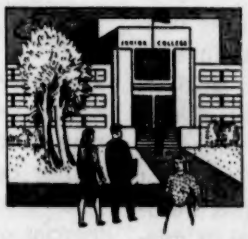
3. Those junior colleges in Group A, maintained by junior-college districts, do not vary so much in the units granted and the class hours required as do those junior colleges in Group B, maintained by high-school districts. The junior colleges in Group A usually offer more courses in mathematics than do those in Group B.

4. Courses which are not year courses are usually offered both semesters.

5. Junior colleges make an effort to meet local needs, as indicated by the fact that many separate single courses are offered.

6. More care should be taken in preparing the description of the courses in the catalogues and bulletins in order to make the information complete.

7. Further study and research are necessary before recommendations relating to the uniformity of units granted in relation to class hours can be justified.



Which Road in Teaching Arithmetic?

". . . There is not much social utility in arithmetic unless its computation is 100% accurate. The clerk in the store loses his job if his arithmetic is not 100% accurate. The bank teller and the bookkeeper if not 100% accurate lose their standing in the business world. The elimination of much useless content from the old arithmetics was a good step, but when arithmetic was shorn of a large amount of its content and at the same time the old 70% mastery standard was still retained, nothing but a downward road in arithmetic could result. It would have been better if these writers had shown that our pupils do not attain the desired 100% mastery in the simplest and most used arithmetical processes which they will need as adults and thus had emphasized instead the need of a positive program to achieve accuracy.

"There are two roads open to us in the teaching of arithmetic in our schools. On one road, which we have been travelling for centuries, we teach more complex arithmetic than the child needs or understands with a 70% mastery. On the other we teach certain minimum essentials, found to be necessary, with 100% mastery. Which road shall we follow?"—J. T. JOHNSON, *Chicago Teachers College*, in JOURNAL OF EDUCATIONAL RESEARCH, Vol. xl, No. 7 (March, 1947), p. 538.

Junior-College Survey Course in Mathematics

By HENRY OSNER

The question "Should all junior-college students be required to take the same mathematics courses?" leads to interesting discussions. Therefore, the JOURNAL is publishing the answers to this question as given by several California junior-college instructors.

In this issue, Henry Osner, Instructor in Mathematics and Engineering, Modesto Junior College, gives his answer by suggesting a survey course in which he organizes the content around the students' needs.

In a later issue, Thomas J. Bass, Head, Mathematics Department, San Francisco Junior College, describes the arithmetic program given at his institution and presents the results achieved.

MUCH is being written concerning the teaching of mathematics, and many experiments are being carried on in this field of instruction. Some schools give almost no mathematics; others require mathematics through analytic geometry of all their students. Most of the California junior colleges and universities follow a program between the two extremes, but many are trying a number of changes from the traditional programs.

The basic subjects of algebra, geometry, and trigonometry are still required for technical students by most high schools; and these basic courses are followed by analytic geometry, advanced algebra, and calculus in college. However, many schools are now using integrated courses in which certain subjects, including trigonometry, analytic geometry, algebra, differential and integral calculus, and differential equations (in various combinations) are taught as single courses. For example, Pasadena has an integrated course in analytic geometry, calculus, and differential equations. The University of California is continuing the integrated course in analytic geometry and differential calculus which was introduced in the fall semester of 1946.

But it is in the nontechnical classes that most of the experiments are being made. Nontechnical students who plan to enter college usually take a year of geometry and a year of algebra in high school, whereupon they take no more mathematics either in high school or in junior college. Those students who do not plan to continue in a university may go through both high school and junior college with no mathematics courses or with a single course in commercial or shop mathematics. The result of this practice has been that many high-school and even college graduates are incapable of performing the simplest mathematical reasoning. Many have difficulty in solving problems involving long division, fractions, percentages, and interest; some do not even have the skill to add columns accurately.

In the near future, this difficulty will probably induce many high schools to offer courses designed to overcome this lack of ability. These courses should increase the students' ability to perform elementary mathematical operations, although it is quite probable that another

basic problem will remain—the difficulty of teaching the relationships of mathematics to everyday life. All too often, a student who knows the mechanics of finding 6 per cent of 1600 cannot apply his knowledge when he borrows money, buys insurance, or purchases a car on the installment plan. The housewife has probably forgotten how to find the volume of a sphere or other geometrical body; or even if she remembers, she is usually unable to apply her mathematical knowledge to solving the problem of the relative volumes of large, medium, and small eggs—in order to determine which is the most economical to buy. It is this problem which will be considered here in some detail, as well as the related problem of what type of course would do the most to remedy this failure.

STUDENTS in the technical fields will probably be offered all the mathematics they want, or have time for, in trigonometry, algebra, and calculus. Students with very little mathematical aptitude will probably take the very minimum of mathematics. Thus, the course which is really needed is one which is designed to meet the needs of students with moderate-to-fairly-high mathematical aptitude. Although it should require no preparation beyond elementary algebra and geometry at most, it should be of value to students who have had trigonometry and two years of algebra. Probably, it would be well to base most of the course on arithmetical principles, adding a few basic algebraic principles. To put it in the words of the National Council Report: "The junior college should offer at least one year of mathematics which is general in appeal, flexible in purpose, challenging in content, and functional in service."

IF, then, it is assumed that there will be a rather wide variety of both college-preparatory and terminal students in the class, the problem arises: What should be included to meet their needs and hold their interest? The course should not be entirely practical. The solution of problems by the use of pure reason affords a keen pleasure to many people, and to deny the opportunity to enjoy this mathematical pleasure to everyone except the mathematician is almost as unfortunate as it would be to deny the pleasure of music to everyone but the musician. In considering the interpretation of statistics, problems of logic and mathematical logic almost inevitably arise which might well be studied in some detail. Similarly, many other problems of theoretical importance will naturally arise from practical subject matter. Other items of theoretical interest and importance could also be introduced from time to time.

Although theoretical mathematics can and should be included, the practical aspects should constitute the chief portion of the course. It is possible to solve most of the mathematical problems of daily life with nothing more than arithmetic and elementary algebra. Thus, it should be possible to base the course on these elementary subjects. Actually, of course, all mathematics is so interrelated that it is somewhat meaningless to speak of theoretical and practical mathematics as two different subjects.

ALTHOUGH it is not possible to have students study only what they want, it is undeniable that they learn more from a course if they enjoy it. Students are almost certain to take a keen interest in a subject when they can see that it will be of great value to them personally. Therefore, the course will probably be of maximum value and interest only if it is closely related to other courses, such as economics, psy-

chology, physics, and chemistry—as well as the everyday problems of the students.

To develop a complete curriculum on paper would be unadvisable, for the subjects included must depend on the length of the course, the students' abilities and needs, the community's needs, and the experience and training of the instructor. However, it seems evident that any course of the type under consideration would have to have statistics and mathematics of finance as its corner stones. To these might be added any number of subtopics, depending on the needs and the interests of the students—for example: elementary trigonometry, mathematical machines (such as calculating machines, planimeter, and slide rule), carpentry and shop problems, aeronautical mathematics, as well as mathematics applied to elementary astronomy, physics, or engineering.

An outline which might serve at least as a general basis for a survey course based upon the foregoing statements for students in the junior college is given below.

TERM REPORT

This would be a mathematical study of some subject, probably in the student's field of major interest. It would be included for two reasons: (1) to stimulate the student's interest in mathematics and (2) to teach various mathematical topics. Obviously, there would be dozens of topics which could be considered, but only five samples of the possibilities and only a few of the possible subtopics within these topics will be listed here.

I. Cost of an automobile

A. Costs per mile
   1. Gas and oil (relative expense per mile of high-test and inferior gasoline)
   2. Mileage on long trips, mountain driving, and stop-and-go travel
   3. Mileage in low gear, second gear, and high gear
   4. Repair costs

B. Costs per month
   1. Depreciation
   2. Interest
   3. Storage (in a private or a commercial garage)

C. Total cost of operation during a semester
   1. Why some items are computed on a monthly basis and some on a mileage basis
   2. Why some items should appear both places

D. Value of an automobile
   1. Saving on taxi and street-car fare and train tickets
   2. Saving in time
   3. Saving in shopping at most desirable stores (even though somewhat distant)
   4. Added convenience in daily life
   5. Added convenience for vacations
   6. Necessity of a car for some jobs

(There are innumerable other topics which the student might include: relative expense of trading in a car every year compared to turning it in every four years or every ten years; relative expense of different makes and savings on gas and time made by improving mountain roads.)

II. Cost of operating a home

A. Cost of renting a home
   1. Rent
   2. Utilities

B. Cost of owning a home
   1. Initial expense
   2. Interest on investment
   3. Repairs and depreciation
   4. Insurance
   5. Utilities
   6. Taxes
   7. Relative expense of various types of houses over a period of years

C. Food costs
   1. Percentage of budget for various items: meat, milk, eggs, vegetables
   2. Relative cost per calorie of various foods at various seasons
   3. Relative costs of fresh, canned, frozen, and dehydrated foods, including price per pound, wastage, vitamin-content, and time for preparation
   4. Comparison of costs of various brands of food

D. Costs of household appliances
   1. Initial cost, interest, and depreciation
   2. Time-saving and improvement of product by labor-saving appliance, such as a washing machine, by comparing with home laundry without machine and with laundry service

E. Budget
   1. Percentage-allotments to various expenses
   2. Method of saving to cover depreciation and repair expenses
   3. Advantages and disadvantages of installment buying in terms of total cost and interest

(The list could go on and on, but these items give the general idea of the topics which might be included in a paper on the home. It should be noted that these topics involve mathematics of finance and statistics. It should become evident to the student that life cannot be considered purely mathematically; the pleasure of owning a car has no exact numerical value, nor has the difference in the pleasure in eating fresh and canned peas, but these variables must also enter into our decisions of what to buy. We should study the mathematical advantages of various products and then act in terms of both mathematics and the less-tangible values.)

III. Mathematics for the doctor

A. Expenses of sickness in various types of families
   1. Variation with income and profession
   2. Variations with seasons

B. Determination of a fair rate to charge in a co-operative plan or clinic plan in order to cover expenses and to pay a fair wage to the doctor employed
   1. Relation of this amount and the amount now spent yearly by various families (as found in Part A)

C. Statistical problems related to tables of mortality and mortality from various diseases

D. Determination of the minimum percentage of the student-body of a school with an infectious disease before the school should be closed

E. Determining the reliability of a new discovery by statistical methods

IV. Mathematics for the teacher

A. Relation of the days of illness and student-failure

B. Use of achievement in high-school subjects to predict achievement in college subjects or in a given profession

C. Relative value of a given salary in various types of communities
   1. Different costs of budgetary items, such as food, transportation, entertainment, lodging, and clothing

V. Costs of a farm

A. Initial cost

B. Interest on land and improvements

C. Depreciation of land, buildings, and equipment

D. Costs of fertilizer and increased productivity

E. Comparison of expense of a machine, including initial expense, depreciation, and interest, when performing the operation without the use of machinery

(These are simply samples of what might be done in a few fields. Obviously, projects can be adapted to any program—terminal or academic. The project can also be adjusted to meet the needs and capabilities of the students. Most of the topics will require a knowledge of elementary statistics, percentage, and arithmetic; and most of them will not require a knowledge of interest. Therefore, these topics should be introduced in the body of the course at an early date. The students can and should begin gathering their data almost at the beginning of the course, however, especially for topics which will require a series of values, such as the determination of price indexes.)

CLASSROOM SUBJECT MATTER

I. Brief arithmetic review

A. Percentage
   1. Computation of percentage
   2. Meaning of percentage

II. Statistics

A. Averages
   1. Calculation
   2. Meaning
   3. Knowing when an average is a good sample and when it is not (Use of range of middle 50 per cent when there is a wide dispersion and extreme values and their interpretations)
   4. Median and its uses
   5. Mode and its uses

B. Preparation and interpretation of graphs
   1. Preparation and use of tables
   2. Emphasis on line graphs
   3. Preparation of line graphs, bar graphs, pie graphs, and picture graphs
   4. Information which will be most obvious in each graph
   5. Cases in which each of the various types should or should not be used
   6. Information which can be deduced from various types of graphs

C. Elementary correlation
   1. Methods of testing correlation (rank-order method)
   2. Interpretation of correlation (meaning of numerical values of correlation coefficient and frequent error of cause-and-effect reasoning from correlations)

D. Statistical predictions
   1. Cases in which they are valid
   2. Cases in which they are not valid

III. Mathematics of finance

A. Simple interest
B. Compound interest
C. Depreciation and amortization (elementary theory)
D. Interest on loans of various types
   1. Bank
   2. Loan company
   3. Insurance
E. Interest in installment buying
F. Elementary tax problems
G. Insurance

(The student should understand clearly the relation between security of investment and rate of interest. He should also realize that a sound business or farm must yield the businessman or the farmer both a return on his investment and a salary. He should realize that persons working for a salary should have some form of investment just as the businessman has his business.)

IV. Algebra

A. Simple equations
   1. Use of a given equation (such as "cost equals cost per unit times units," "distance equals rate times time," and interest equations
   2. Determination of equations (units of measurement)
B. Exponentials
   1. Volumes (of various containers, comparison of volume of large, medium, and small eggs, crop growth and animal increases)

(This section might include signed numbers, solution of simple equations in terms of different variable, logarithms, or any other topic from elementary algebra which the students might need.)

V. Trigonometry

A. Definition of functions in terms of right triangles
B. Natural tables of trigonometric functions
C. Solution of right triangles
D. Solution of oblique triangles by the use of right triangles in simple cases

THIS outline is at best only a rough approximation to what might actually be taught. One very important aspect of the course which cannot be brought out in a listing of items concerns those interrelations in mathematics which should be emphasized: for example, the use of algebra in trigonometry. A review of algebra might even be included with the study of trigonometry. The relation of both trigonometry and algebra to the physical world could be demonstrated by the solution of elementary problems in astronomy and surveying. Statistics could hardly be taught without references to probability, which would introduce some of the problems met in probability. Indeed, a study of chance would perhaps be very valuable.

The student should learn to think in mathematical terms in order to prepare him to make up equations for problems he may meet, prepare tables and graphs, and perform other mathematical operations which will be of value to him at home or at work. He should learn to understand the relation between a mathematical result and its physical meaning, as in the computation of interest or volume.

The choice of a textbook for such a course will depend largely on the taste of the instructor. Probably no textbook will be adequate, particularly if the course is to be varied constantly to meet the needs and the interests of the students. Perhaps the best solution would be not to use a textbook for most of the course, using instead reference books.

THERE are several obstacles which must be met in introducing and offering such a course, the first of which is a probable lack of enthusiasm on the part of the students. Unfortunately, many students, even those with rather high mathematical aptitude, have an aversion to mathematics and a feeling of incompetency in it. To overcome this feeling, the junior college must make the course as interesting as possible, and the person selected to teach it must be motivated by enthusiasm.

Mathematical Concepts Through Social Studies

By EDITH L. MOSSMAN

MATHEMATICS is a science, a closely-knit science. In fact, one cannot experience real success in junior- or senior-high-school or college mathematics or in home or vocational activity requiring mathematical thinking if there are gaps in the logical sequence of mathematical concepts. And a child in elementary school cannot build the strong foundation necessary unless his training or development is based upon his experience so that the new concepts have meaning for him.

Too often, arithmetic lessons in the elementary schools have consisted in large part of unthinking drill, mechanical following of directions, "flipping symbols" that are more or less meaningless. Enough of this sort of thing, under certain advantageous conditions, has often produced high scores on standardized tests, especially on the simple, computational part in the "expected" pattern, if given *soon* after cramming. But as a strong foundation for understanding the fundamental principles of mathematical processes and ways of thinking, the result has been tragically inadequate.

Results of this type of training are evident when the children-grown-up attempt to use their mathematics in the fields of higher and applied mathematics and in the practical use of simplest arithmetic in shops, stores, factories, and homes.

And here is a very strange fact. In spite of the proverbial inability of the many to do independent work well either in school or out of school, we often hear people demanding more and more of this same kind of arithmetic drill, which has proved to be worse than a waste of time. Not only does it fail to build for understanding; but in many cases, it engenders attitudes of fear and dislike toward the subject.

Edith Mossman, who believes that teachers of mathematics in the secondary schools should be concerned about the mathematics provided in elementary schools, presents a suggested program for developing mathematical concepts through a social-studies unit in elementary school.

Formerly a teacher of mathematics in junior and senior high schools in Berkeley and Richmond, Miss Mossman retired from teaching this year. At present, she is tutoring in mathematics, working on some textbooks, and studying the pipe organ.

The program in the modern school has "put the finger squarely on the sore spot"—namely, the uselessness of meaningless drill. The recognition of this fact is good. However, in some cases, individual teachers have gone to the other extreme with such erroneous ideas as these: (1) No drill is needed at all; (2) incidental learning in arithmetic is sufficient; and (3) the child should be taught only what he asks for.

WHERE is the sane middle ground that retains whatever has been proved to be good in the traditional and also introduces that part of the modern method which corrects the weaknesses of the past? To achieve such a position,

these changes in the traditional must be instituted: (1) developing the *meaning* of number concepts through experience in social studies and other activities; (2) presenting a topic of mathematics after the child has the background and maturity that will make it possible for him to *understand* the work; (3) introducing many topics at a later time, eliminating others entirely; (4) establishing a special arithmetic period no earlier than the second grade; (5) fixing points by means of *meaningful* drill *after* there is understanding; (6) listing concepts which the children should have acquired by the end of the year, securing continuity in a real developmental program; (7) keeping a cumulative record of the experience of each child, planning his work around his needs, and creating an opportunity for him to watch his own improvement rather than competing with others.

Jane Sherrod has written an excellent unit on aeronautics, called "Preliminary Preparation of a Unit of Work for the Sixth Grade." From this social-studies unit, there will develop many mathematical concepts, some appearing in the consciousness of the child for the first time, others being enriched, deepened, broadened here, having appeared one or more times before in connection with other units of work or in out-of-school activities.

At one or more (usually more) points in the progress of this unit on aeronautics, the boys and girls feel the need of growth in knowledge or skill in the following:

I. Measurements
   1. Linear: ft., in., yd., mi.
   2. Capacity: pt., qt., gal., bbl., bu., cu. in., cu. ft.
   3. Weight: oz., lb., ton
   4. Angles: 90°, 45°, 30°, 60°, 360°
   5. Time: hr., min., sec., decade, century
   6. Pressure: lb. per sq. in. or per sq. ft.

II. Time Line

III. Drawing to Scale

IV. Reading Various Kinds of Maps (Projections)

V. Drawing Maps

VI. Simple Common Fractions: 1/2, 1/3, 2/3, 1/4, 3/4, 1/5, 2/5, 3/5, 4/5, 1/6, 5/6, 1/8, 3/8, 5/8, 7/8, 1/10, 3/10, 7/10, 9/10

VII. Money and Costs

VIII. Fundamental Processes with:
   1. Whole numbers
   2. Simple common fractions
   3. Decimal fractions

IX. Averages

X. Keenness and Accuracy in:
   1. Reading
   2. Observing
   3. Listening
   4. Speaking

Here are a few illustrations from among the great number of problems that will really help during the special arithmetic period to develop concepts and to strengthen or maintain skills, because based on the child's experience, they have a background of meaning:

1. Ceilings of two planes are given. How much higher is one than the other?

2. The longest flight at Montebello was 19 sec.; at Puente, 1 min. 21 sec. How much longer was the second?

3. The Little Lake rain gauge recorded this rainfall: March 14, .6 in.; March 17, .75 in.; March 18, 1.6 in. What is the total rainfall?

4. Sound travels one mile in 5 seconds. Thunder was heard 25 seconds after seeing the flash of lightning. How far away was the storm? How far for 54.5 seconds?

5. What are the different possibilities of notes in a measure of 4/4 music?

6. What length of rest must be used to complete a measure having 2 eighth-notes and 2 quarter-notes?

7. In a cross-country race of 1,000 miles, two pilots took off at 11 A. M. Both arrived at the finish that afternoon—one at 4:40; the other, at 5:20. How much quicker did the first make the trip? Find the average speed of each.

8. On Friday, March 7, the barometer read 30.1. On Friday, March 14, it read 28.8. How much did the air pressure fall during this week?

9. If the r.p.m. (revolutions per minute) of the propeller of a certain airplane at cruising speed is 1,800 r.p.m. and at top speed is 10 per

cent more, how many more r.p.m.'s is the propeller "turning up" at top speed?

10. If an airplane factory worker makes $1.10 an hour for regular time, and time and one-half for overtime, how much would he make in one week if during three days he worked 3 hours overtime on each?

MANY teachers of mathematics in junior and senior high schools complain bitterly that the great majority of the pupils do not "use their heads" on the story problems. A highly-intelligent boy or girl will go through the motions of solving a problem on the board, leaving an absurd answer. He does not notice how absolutely impossible his result is in the situation, nor does anyone in the class challenge his statement.

Too much and too early, number work has been forced in, when children were not mature enough and did not have sufficient background of experience necessary for understanding. At first, they were alert and eager, full of questions. But after they have covered pages and pages of note paper with these queer little symbols, mechanically trying to copy a given pattern, and after they have been hopelessly unable to understand "what it is all about," they decide that schoolroom arithmetic does not employ "common sense," and they stop questioning its value or trying to relate it to their own experience.

HOW different from this is the situation in a good aeronautics unit! No one there can make an unreasonable statement, whether or not it involves any mathematics, without being instantly challenged by several in the class.

As mathematics teachers, let us rejoice that in the social-studies classes, there is a keeping alive of active thinking, and the offering of splendid foundational work, based on the experiences found there, in giving *meaning* to fundamental concepts in mathematics. This practice, then, followed in regular arithmetic periods of upper elementary grades by meaningful drill on points already understood, and by story problems based on the experience of children, can prevent "gaps" and can pave the way for real success and pleasure in school and out—in this field of mathematics.

Often, the child comes to a point in his work on the aviation unit where he must use some knowledge or skill that is mathematical. It may be a concept totally new to him, and so the teacher presents it then and there. Or it may be a topic that has come to the child's attention before. Here may be a good opportunity for practice on the skill or for enriching or clarifying the concept. The point is that the motivation has been taken care of; the pupil is ready and eager, with sufficient maturity and a feeling of need for this bit of knowledge or skill.

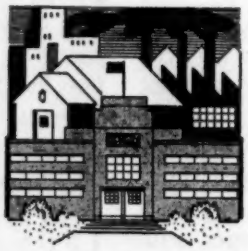
IN this possibility of developing mathematical concepts in any social-studies unit, there will arise not only situations in which something mathematical must be done at once; but also in the planning, sharing, and evaluating, some remark will be made that gives the teacher a natural opportunity to bring in mathematics. She may take advantage of this opportunity and lead in meaningful discussion that helps greatly in the foundation of *understanding*. But she may realize that such a proceeding would break into an important continuity of thought in the group. In that case, she will just make a mental note of the item and introduce it later in a regular arithmetic period.

One other point is important in this discussion of mathematical development that may come out of the social-studies unit on aeronautics. When one boy's model airplane *flies* beautifully

and that of another is a "flop," because the first boy used accurate measurements and the second did not, both will see very clearly, indeed, the absolute necessity of exact measuring. Here will be a concept deeply-impressed because it has been gained in actual experience. Taking that correctly-built airplane home tells more than does many a grade on a report card.

And we must not overlook other phases of value that come from any deep learning experience, whether it be construction or a mathematics concept. In this boy's accomplishment, there is an emotional overtone of great value, a satisfaction, a pleasure in something *well-done* and added confidence in one's ability to carry through other activities successfully.

THEN, too, intelligent and sincere appreciation of some one else's work is necessary in fully-rounded development. Each one who has completed an excellent airplane will not only evaluate highly what the others in his class have done, but he will be ready then to be led to appreciation of man's accomplishment all along the way from long ago to now in the various fields of good human endeavor.



Education for Appreciation vs. Education for Efficiency

"Most promising among the newer trends in American education is that of supplementing instruction, by one means or another, with conscious cultivation of attitudes and interests. The tendency has arisen out of a growing sense of the inadequacy of purely intellectual training. It is reinforced by the assurance of psychologists that the education of interests and attitudes is altogether feasible. In many respects the movement is the most significant in recent educational history. . . ."

"Our attempts to make the schools practical have resulted in making them too materialistic, not necessarily in their philosophy, but in their emphasis. . . . Efficiency is a means of *getting* things rather than of *enjoying* them after they have been secured. . . . Not only is the emphasis upon the material aspects of civilization, but, in the second place, the method of approach is analytical. . . ."

"It may be more difficult to select a curriculum which will effectively cultivate appreciation of the great values in civilization than to select one which will produce efficiency; but the very difficulty may lead to more careful analysis than has seemed necessary in determining a curriculum for knowledge and skill. There is no more arbitrariness in the selection of one than of the other. Moreover, it is hardly worthy of this age of science to insist that the task is impossible. If we are convinced that our major need is a curriculum by means of which training can be given in the appreciation of values, then, of course, we shall proceed to create such a curriculum."—HAROLD SAXE TUTTLE, *Professor of Education, City College of the City of New York,* in THE SCHOOL REVIEW, October, 1946, pp. 462-466.

Professional Opportunities In Electrical Engineering

By CHARLES F. DALZIEL

To provide teachers and counselors with information concerning one of the fields of employment for students with aptitude for and interest in mathematics, Charles F. Dalziel has prepared this article on the professional opportunities in electrical engineering. As Associate Professor, Division of Electrical Engineering, College of Engineering, University of California at Berkeley, Dr. Dalziel's duties consist of teaching, research, counseling, and administrative assignments. During the war, he was Supervisor, ESMWT, and took an active part in the University's statewide program, specializing in shipyard training. He is particularly interested in the opportunities open to graduating engineers, as evidenced by the fact that many of the forty articles which he has published are devoted to this topic.

AS a preface to a discussion of opportunities in electrical engineering, it is appropriate to define certain terms used in this occupation. For example, *electrical engineering* is the name given to that part of the general field of engineering having to do with the technical details of electrical machinery and equipment. The term *electrical engineer* is a professional term similar to such titles as attorney, physician, or architect. The title *electrical engineer* applies to a man who works in the electrical industry, or one who is employed in those parts of other industries dealing with electrical apparatus, machinery, and equipment. It is used to denote a person who is qualified by reason of training and experience to supervise and assume the responsibility for important electrical projects. Use of the title implies that the person is thoroughly competent and has a sound technical training and years of practical experience in various phases of electrical work.

The term *electrical engineer*—or for that matter, any engineer—must not be confused with the term *mechanic* or *technician*. The difference between an electrician and an electrical engineer is similar to the difference between a carpenter and an architect. Stated crudely, it might be said that the carpenter is paid to use his hands; whereas, the architect is paid to use his head. In more elegant phraseology, the carpenter is employed to use his mechanical skill in repairing an existing structure or in following recognized procedures in the construction of a new building. In contrast, the architect is employed to use his mental abilities and technical knowledge to create new designs or to supervise the building of a structure. The craftsman uses the trade skills of his craft; the professional man applies both the art and science of his profession. The carpenter is responsible to the architect; the architect is responsible not only to his client but to society at large.

An electrician—a general name for a journeyman craftsman, such as a house-electrician, maintenance-electrician, automotive-electrician, marine-electrician, radio-technician, lineman—wires a house, repairs home appliances, rewinds and installs electric motors, wires an automobile, installs marine

electrical equipment, repairs radio equipment, and builds and maintains high-voltage transmission lines, communications circuits, and radio stations. In performing his work, he follows the designs, specifications, instructions, and possibly the personal advice of the electrical engineer. In general, to be a technician requires a high-school education, followed by vocational training of one or two years, and from one to five years of practical experience before being classified as a journeyman.

THE electrical engineer is a highly-educated man. A successful career in electrical engineering requires intellectual abilities requisite for college graduation and personal qualities, such as good health, ability to work with others and to take orders from others, a good measure of common sense, and—above all—a good reputation. Both the electrician and the electrical engineer must possess keen intellect and years of training; both callings are honorable and require imagination and the ability to visualize things which cannot be seen; and both require fortitude for hard and sometimes disagreeable work. In the past, many men with very little formal education have become famous engineers by reason of diligent home study, years of practical experience, and successful accomplishment; however, this method of approach to professional recognition is about closed. This situation has come about because of the greatly-increased amount of technical information which must be thoroughly mastered, the development and expansion of educational facilities in all sections of the country, and the competition due to the constantly-increasing number of engineering graduates. In order to be known as an engineer today, it is assumed that one has graduated from a university of high standing. At this point, the potential engineer would probably secure employment as an engineer-in-training, student-engineer, junior-engineer, test-man, or some such title. Assuming that he gets his fair share of the breaks in life, he should earn promotion to the title of engineer in, let us say, ten to fifteen years of hard work. To be a successful engineer, one's work must have the reputation of being safe, capable of serving a useful purpose, and economical.

Electrical engineering is one of the youngest of the divisions of engineering; it has enjoyed tremendous growth since 1900, and many billions of dollars have been invested in the industry. From all present indications, we are about to witness a very substantial expansion in every phase of the industry. Like all dynamic activities, this growth and expansion will not be at a uniform rate in the various fields of the industry, nor will it take place in all fields at the same time. Some enterprises will continue much as they have in the recent past; while others will expand at a greatly-accelerated rate. Tremendous progress was made in radio telephony during World War I, and the resultant new developments in vacuum tubes were responsible for the spectacular expansion of radio broadcasting immediately following. Radar, aircraft flight instruments, and radio navigational aids were perfected during World War II. To what extent these devices will be further developed remains to be seen. Today, the most promising fields appear to be the application of electronic tubes in the control of industrial machines and processes and in the development of hydroelectric and atomic-electric power. Just what will be the most promising field tomorrow cannot be determined until that day arrives.

ALTHOUGH this discussion is primarily intended to assist young men seeking employment in the electri-

cal profession upon completion of their higher education, some of the ideas may be helpful to high-school students in choosing the electrical profession for their lifework and in making preparations for beginning their technical education. A word to these younger men is, therefore, appropriate. Those about to commence their higher education should be advised to take courses of a general technical nature, together with a broad selection of cultural courses. Selection of highly-specialized courses should be postponed until the beginning of the senior year. Even after tentative selection of a particular field of specialization, the student should be warned against becoming mentally-fixed in his choice. Many students become so enthusiastic over their choices of certain professional courses that they find it difficult to make minor changes to guide their advanced studies into fields which have the greatest potentialities for immediate employment upon graduation. Since the war, several employment services report a shortage of power and industrial engineers and an excess of graduates in high-frequency communications. In spite of the rather widespread knowledge of the surplus of communications men, colleges and universities all over the country report greatly-increased enrollments in this field. Because it is difficult to foresee future opportunities in any field, the student would do well to delay final choice of his field of specialization as long as possible. In the meantime, he should be urged to make the acquaintance of practicing engineers, his instructors, and his father's business associates. He should discuss his problem freely with informed persons; attempt to evaluate his own prospects for a successful career in light of his personal desires, his special talents, and the wishes of his family; and govern himself accordingly.

A WORD should be said about the engineer's first job. Although it is natural that a young man should look forward to obtaining a position carrying the title of engineer, it is rare indeed for one without practical experience to obtain such a position, especially for his first position. Many companies insist that their future engineers acquire an intimate knowledge of their machines—how they are constructed, assembled, tested, and designed. Obviously, the best way of obtaining this information is an assignment in the shop, on the test floor, or in the drafting room. Many leading executives and outstanding engineers "got their start" by accepting a job near the bottom of the ladder. However, in recent years, there has been a tendency for graduating engineers to shun work of a subprofessional character. Today, young men often make the mistake of accepting a position, possibly one carrying an attractive title, without giving sufficient thought to the possibilities of ultimate advancement. As a result, many promising young men accept pseudo-engineering jobs—only to find in a year or two that they have reached a dead-end. It is better to accept a job with a future. Most executives realize that technically-trained men are not happy permanently in subprofessional work. Many concerns have adopted definite procedures; some have rather elaborate training programs, in which the young engineer is assigned to various departments, such as drafting, design, estimating, testing, assembly, or maintenance for periods ranging from two to six months. Of course, the time spent in training varies with different companies; but usually after two or three years, a man who has promise finds himself promoted to a satisfactory position in keeping with his capabilities.

WHILE the term *electrical engineering* identifies a particular field of engineering, the subdivisions given in Table I may be helpful in framing a more detailed picture of the various activities included under the general title. Each item requires research, development, design, construction, sales, maintenance, and supervision. Opportunities for professional employment tabulated according to some of these functions are given in Table II. It is apparent from an inspection of this table that most young men start their careers in the electrical profession by becoming associated with some established enterprise. Very few, indeed, will find it either practicable or desirable to equip an office and start out on their own immediately upon completion of their formal education.

TABLE I—SUBDIVISIONS OF ELECTRICAL ENGINEERING

ELECTRIC POWER

Electric power generation, transmission, and distribution; heavy and light electrical machinery, equipment, and apparatus.

Electric power utilization: home and farm appliances, agricultural machinery and equipment, advertising displays.

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INDUSTRIAL POWER AND CONTROL

Electrically-powered machinery and control equipment; electronic control equipment: welding, lighting, speed, processing, positioning, etc.; electronic sorting and counting devices; high-frequency heating of metals and dielectrics; electric furnaces and heating equipment; conversion equipment; industrial radiography; spectrochemical analysis; flaw detectors; electrostatic spraying equipment.

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COMMUNICATIONS

Telephone; telegraph; teletype; radio telegraph, telephone, broadcasting, and television; radar, loran, direction finders, altimeters, depth finders, and other navigational aids; sound-recording and public-address systems; facsimile transmission equipment.

•

ILLUMINATION

Residence; commercial; street lighting; automotive; navigational lights; recreation; depots and airports; advertising.

•

TRANSPORTATION

Electric traction: locomotives, street cars, and trucks; machinery, switches, signals, supervisory control, and automatic train control equipment; electric ship propulsion and auxiliaries; aircraft electrical equipment and control devices.

•

ELECTROCHEMICAL

Industrial electrochemical processes; electrolytic extraction of metals; electrolytic refining of metals; electric furnaces; electro-plating; electrochemical oxidization or reduction of organic chemicals.

•

ELECTROMEDICAL

X-ray; electro-cardiograph; electro-encephalograph; diathermy; electro-therapy, infra-red and ultra-violet radiation equipment; biological application and measurement of radio-active tracers; electronic hearing aids; electric stimulators; electro-surgery; electric shock therapy; various electric devices used in diagnosis of disease.

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INSTRUMENTATION

Various types of electrical instruments: indicating, integrating, and recording.

TABLE II—TYPES OF WORK AND QUALIFICATIONS IN ELECTRICAL ENGINEERING

Type of Work	*Distinguishing Qualifications*
Design **Research** **Development**	High scholastic attainment in technical subjects. High degree of analytical ability. Inventor, scientist. Usually requires a higher degree, such as M.S., E.E., or Ph.D.
Teaching	High scholastic attainment in technical subjects. High degree of analytical ability. Ability to explain to others; ability to write. University teaching usually includes opportunities for research. Requires B.S. degree and 5 to 10 years' practical experience, or a higher degree, such as E.E. or Ph.D.
Consulting	Outstanding personality and reputation. Requires ability to practice both the art and the science of engineering. Good opportunities at very substantial fees. End job—usually transfer here after successful career in design, application engineering, or teaching.
Contracting	Good personality and general over-all ability. Must like construction and get along with building trades. Opportunities in California. Earnings dependent on general business prosperity.
Construction **Operation** **Maintenance** **Safety Engineering**	General ability. Ability to get the other fellow to work. A vital activity. Many opportunities in California. Good pay.
Application Engineering **Sales Engineering**	Good all-round ability. Contacts with other engineering activities. Trips on company expense. Interesting work. Many opportunities in California. Good pay.
Management	Ability to get along with company officials and labor unions. Requires great insight into human nature. Must be skilled at practicing the art rather than the science of engineering. End job—usually transfer here after years of experience in engineering departments. No upper limit of pay.
Commercial: **Purchasing** **Accounting** **Publicity** **Attorney** **Patent Attorney**	Splendid opportunities for men with B.S. degree in engineering and a degree of aptitude in business administration or law. Opportunities for a few men in larger enterprises each year. Good-to-excellent pay.
Rate Supervision	General engineering background and business ability.
Evaluation	Opportunities in California. Good pay.

Any discussion of professional opportunities in electrical engineering would be incomplete without mention of some of the concerns engaged in the business. In an article of this length, it would be inappropriate to present anything approaching a comprehensive list of firms; however, a few of the enterprises serving the electrical industry listed in alphabetical order and without regard to their relative importance or size are given in Table III. In addition to national leaders, most of which maintain establishments in California, a few California companies are included to illustrate possible local employment opportunities. It should be pointed out that because of the differences in relative importance or size of the various concerns, the number of entries in the various classifications should not be taken as an accurate measure of the number of probable job opportunities. Many of the larger concerns are engaged in such a wide variety of activities that it is difficult to decide just where they should be placed in the table. The author has attempted to list the companies with regard to some of their major activities. (The list is subject to change.)

TABLE III—ELECTRICAL ENTERPRISES

	Manufacturing Concerns	*Operating Utilities*	*Research*	*Government Agencies*
Electric Power	Allis Chalmers Crocker Wheeler Elec. Eng. & Mfg. General Cable General Electric Line Materials Ohio Brass Pacific Electric Mfg. U. S. Electrical Motors Wesix Electric Heater Westinghouse Electric	California Electric California Oregon Power Pacific Gas & Electric Southern California Edison San Diego Gas & Electric	Allis Chalmers General Electric Westinghouse Electric	California Public Utilities Commission City of Los Angeles City of San Francisco City of Sacramento Federal Power Commission U. S. Bureau of Reclamation Rural Electrification Administration
Industrial Power and Control	Allis Chalmers Cutler Hammer Eimao General Electric ITE Circuit Breaker Leeds & Northrup Minneapolis Honeywell Square D Ward Leonard Western Electric Westinghouse Electric Weston Electrical Instrument		Allis Chalmers Bell Telephone Laboratories General Electric Litton Laboratories Minneapolis Honeywell Westinghouse Electric	
Communications	Kimac Collins Radio General Electric General Radio Gilfillan Radio Heintz & Kaufman Hewlett Packard Radio Corp. of America Ratheon Mfg. Western Electric Westinghouse Electric	American Tel. & Tel. Mackay Radio Pacific Tel. & Tel. Radio Corp. of America Southern Calif. Tel. Co. Western Union	Bell Telephone Laboratories Douglas Aircraft Electronics Research Federal Tel. & Radio General Electric Hazeltine Research Laboratories Hughes Aircraft North American Aviation Radio Corp. of America Westinghouse Electric	California Public Utilities Commission Civil Aeronautics Authority Federal Communications Commission National Bureau of Standards U. S. Army U. S. Navy

Illumination	Corcoran Brown Electrical Products Ford Motor Car General Electric General Motors Holophane S & M Lamp Sylvania Electric Westinghouse Electric	California Electric Corp. California Oregon Power Pacific Gas & Electric Southern California Edison San Diego Gas & Electric	Bausch & Lomb Eastman Kodak Electrical Testing Laboratories General Electric Sylvania Electric Underwriters Labs., Inc. Westinghouse Electric	California Public Utilities Commission California Department of Public Works City of Los Angeles City of Sacramento Federal Power Commission National Bureau of Standards U. S. Army and Navy
Transportation	Allis Chalmers Electric Storage Battery General Electric Union Switch & Signal Westinghouse Electric	Chicago, Milwaukee & St. Paul R.R. Key System R.R. New York, New Haven & Hartford R.R. Pacific Electric R.R. Pennsylvania R.R.	Allis Chalmers Consolidated Vultee Aircraft Douglas Aircraft Lockheed Aircraft General Electric Westinghouse Electric	California Public Utilities Commission Interstate Commerce Commission U. S. Army U. S. Navy
Electrochemical	Ajax-Northrup American Manganese Steel Casting Clorox Dow Chemical General Metals Permanente Metals Electric Storage Battery		Aluminum Company of America Anaconda Copper General Electric Kennecott Copper National Carbon Westinghouse Electric	National Bureau of Standards U. S. Bureau of Mines
Electromedical	Al Bush Electric Arnold Beckman Instrument Cambridge Instrument Consolidated Engr. General Electric X-Ray Corp. Pacific Scientific Picker X-Ray Technical Associates Westinghouse Electric		General Electric X-Ray Corp. Westinghouse Electric	National Bureau of Standards

Teaching and Research

Universities in the State of California offering substantial work in electrical engineering are: University of California, Berkeley; California Institute of Technology, Pasadena; University of Southern California, Los Angeles; Stanford University, Palo Alto; University of Santa Clara, Santa Clara.

Opportunities for employment have existed in the past. Many attractive openings exist today; and because much remains to be done, opportunities will present themselves in the future. One does not have to be a genius to make a success of what may at first sight appear to be merely a job. Any good man with a sound technical education and a good personality, unafraid of work, and with a determination to be useful, will be amply rewarded in time. These qualifications, together with one per cent inspiration—the rest perspiration—are all that are needed for success. Of course, a spark of genius will help.

DURING my fifteen years at the University of California, I have watched hundreds of young men graduate in the field of electrical engineering and begin their careers at the bottom of the professional ladder. From subsequent letters, Christmas cards, and personal conversation, I am pleased to report that most of these men have done well, both financially and professionally. Almost without exception, they are happy in their chosen life's work. It is my studied opinion that all fields of engineering will continue to present good opportunities to deserving young men. Engineering, especially electrical engineering, needs well-trained men strong in mind, body, and character.

"Teaching Mathematics Through School Savings"

The revised School Savings Bulletin for grades 7 to 9 retains most of the material in the 1946 edition, adding a rewritten introductory text and new problems and projects. Written by Irene M. Reid, Member, School Savings Committee, National Council of Teachers of Mathematics, the bulletin contains the following contents:

The Role of the Teacher
Part I Important Reasons for Investing in U. S. Savings Stamps and Bonds
Part II Savings Program in Mathematical Terms
Part III Mathematical Concepts and Suggested Activities
Part IV School Savings Problems
Part V Suggestions for Projects
Free Teaching Aids

Copies of this thirty-one-page bulletin are available free of charge from State Savings Bonds Offices.

Cumulative Records in Guidance

By MARIAN W. HODGE
ESTHER GRACE NOLAN

Because record-keeping is an essential part of any good guidance system, schools must be on the alert for effective record forms.

This article on cumulative-record forms is contributed by Marian W. Hodge, Superintendent, Whittier Union High School District, and Esther Grace Nolan, Co-ordinator of Research and Guidance, Los Angeles County Schools. Both authors are interested in developing guidance programs, but Mrs. Hodge is particularly concerned with helping both students and their parents to gain an understanding of guidance records and to make effective use of them. Here, we read of Whittier's efforts to develop forms that "really work."

WHITTIER Union High School, one of the larger Los Angeles County high schools, has for some time felt the need for developing a cumulative-record system that can be readily functionalized in the school, as well as understood, interpreted, and utilized effectively by all of the teachers. The administrator, counselors, school physician, school nurse, and teachers have felt that it would be valuable to have a record folder that would permit growth and expansion, that would include elementary-school data, as well as the student's high-school record, and which could be passed on as each student progressed in school. It was also felt that, to be of real use in student guidance, the information must be readily accessible to classroom teachers, easily understood by them, effectively interpreted, and professionally treated and utilized in student guidance.

The administrator realized that no active good could come from cumulative-record data locked up in unused, dusty files, and that irreparable harm might be done in the misuse of data by new and inexperienced teachers or by those lacking in adequate professional attitude and ability to give confidential treatment to such information.

With these few basic facts and principles in mind, a definite program has been planned around the problem of developing and utilizing a cumulative folder that can be functional.

The cumulative-record folder which has been devised permits the recording of all pertinent student records and facts, test data, school reports, class grades, personality and adjustment record, teacher observations, health record, home and social data, individual case records (where available), special abilities, aptitudes, and interests. The record form also gives space for student photographs to be taken in freshman and senior years, showing physical growth and development.

Where certain confidential data exist, a note to that effect is inscribed on the folder; and, on request, such information is available to the teacher for study where it is filed, such as the office of the school physician or nurse, principal, guidance teacher, counselor, or dean.

All the pertinent student data recorded on the cumulative-record folder are placed in the hands of the Basic

Course teachers for the sole purpose of their utilizing this information as a basis for student guidance. (The Basic Course classes in Whittier Union High School consist of English Orientation in the ninth grade, World Cultures in the tenth grade, American Life in the eleventh grade, and Senior Problems in the twelfth grade.

Teachers other than Basic Course teachers are urged to secure the cumulative folders for their students from the Guidance Office and to study them. A procedure has been devised for this purpose and for keeping track of the whereabouts of each folder temporarily out of its file.

RESPONSIBILITY FOR THE PROGRAM

Early in the school year, the superintendent of the high school divides all the faculty, including the new teachers, into four groups alphabetically, for this plan has been found to permit as accurate and all-round cross-sectioning of the faculty as can be secured—i.e., men and women, subject-matter teachers (academic, industrial, and artistic fields), department heads, and classroom teachers.

The superintendent meets regularly throughout the year with each of these groups in a series of meetings scheduled to study the problem of professional understanding and attitude and their relationship to the use of cumulative data, and other high-school problems. These four series of meetings continually emphasize the integrity of the individual student and are proving to be the basis for fine development of teacher-growth in guidance matters.

At the very beginning of the school year, the Director of Guidance of this high school meets with the new teachers, and this group studies certain cumulative-record folders. The teachers learn where the records are kept, what use is to be made of them, the routine for taking the records from the files for study, and the importance of treating the information confidentially and professionally.

Included also in the superintendent's plans is a course of parent-education classes at each grade level, by means of which the parents actually study a typical "John Doe" and "Jane Doe" cumulative-record folder and learn to understand and interpret its meaning. The superintendent explains the purpose of ability grouping and types of courses suited to individual differences as identified, for example, by test data. In this respect, the parents, with their newly-acquired understanding, co-operate heartily in the program.

At an early auditorium program, the superintendent also explains to the student personnel a typical "John Doe" and "Jane Doe" cumulative-record folder and interprets the information thereon, illustrating the manner in which the information is utilized in student guidance. Because of the approach, student co-operation and effort are greatly increased.

The Basic Course teachers maintain a record of test data, their observations of each student's progress, and any other significant information about the student's home conditions or school achievement. At the close of the year, the Basic Course teacher transfers this information to the cumulative-record folder in the Guidance Office for the use of the teachers in other departments and forwards her own record to the student's next Basic Course teacher. Teachers other than the Basic Course teachers study the cumulative-records in the Guidance Office or check them out for a short period, following prescribed office routine so that no *original* folder is lost or misplaced.

ORGANIZING A CUMULATIVE-RECORD SYSTEM

In Whittier Union High School, each Basic Course teacher has two daily double-period classes and one single class in some related work. This arrangement gives the teachers three daily class rolls and assignments and five recitation periods, at the same time permitting one additional period each day for conferences and the study of test data and other cumulative-record information, for recording guidance data about her students, for recording new test data and observations, and for counseling individual students. The school plan of having each Basic Course teacher keep her groups for two hours a day provides ample time and effective means for careful study and understanding of her students so that she will learn to know each one and to understand his individual capacities, accomplishments, and needs, as well as become acquainted with his family and social background.

A word of warning must be given here regarding the misconception and error in labeling the sixth period of such a program as a "free period." It is intended for anything but that and should be recognized for the purpose for which it is intended—i.e., to facilitate student guidance. Nevertheless, in the last analysis, guidance cannot really exist in a school program apart from *time* and *space;* and unless it is indicated correctly on the master schedule, the misnomer "free period" elicits much uncalled-for and misplaced criticism by ever-ready school critics.

A word about the office or library routine is important for keeping track of original cumulative folders temporarily out of the file. Whittier uses a red card (bright color and tab easily recognizable) for taking the place of the missing folder. On this card, which is about the same size as the folder, are printed rows of spaces labeled: "In and Out," "Time and Date," "Student's Name," and "Teacher's Signature." Therefore, the teacher who is using the folder can indicate the desired information while the record is out of place. This routine applies only to the *original* in the Guidance Office, but it also functions while the Basic Course teachers are using the originals to obtain information, as well as when other subject teachers use the records.

This plan also permits teachers to take the records out of the building for a week night only or over a week-end, provided the records are returned when they are due to be available for other teachers and the guidance personnel while school is in session.

To keep the files from getting "bogged down," all duplicate records are destroyed after the students involved have graduated or permanently moved out of the district, and only the originals are kept.

This high school has four grade counselors—i.e., one each for freshmen, sophomore, junior, and senior classes. These persons have two daily counseling periods. They also work with and advise the Basic Course teachers and any teachers wanting information about certain students or needing help in interpreting recorded data or applying the information to effective class procedure and individual student guidance.

In every case, in doing individual counseling, the counselor or teacher interprets to the student the test findings, not as so many numbers and figures, but in terms of what each means. Especially in the matter of intelligence is this interpretation necessary. Because intelligence is generally considered to be innate, and since students can do little about improving the situation and

METHODS OF CHECKING RESULTS OF USE OF CUMULATIVE-RECORD FOLDERS

ITEM	EXTENT OF USE [CHECK (V) ONE.]				
To what extent:	None	Very little	Some	Much	Very much
1. Has the rapport between teachers and students improved?	—	—	—	—	—
2. Has the attitude of students toward their classes and the school improved?	—	—	—	—	—
3. Do students feel free to discuss their personal problems with teachers or counselors without hesitancy or inhibitions?	—	—	—	—	—
4. Is there a reduction or elimination of discipline problems?	—	—	—	—	—
5. Is there a noticeable emotional and social growth of students?	—	—	—	—	—
6. Do teachers seem to have a greater happiness and satisfaction in their work?	—	—	—	—	—
7. Has the general attitude and atmosphere improved?	—	—	—	—	—
8. Do parents, employers, and community co-operate more freely and understandingly?	—	—	—	—	—
9. Do the teachers exhibit a more understandingly-professional attitude, especially in regard to the integrity of the individual student?	—	—	—	—	—
10. Do the classroom teachers attempt to adjust the program and assignments to meet individual differences?	—	—	—	—	—

thus often become quite depressed over circumstances which they can not correct, I.Q.'s as such are not reported to counselees. An I.Q., being only a derived figure anyway, would not have the meaning that a mental age denotes or that an explanation or effective interpretation carries to the student. For these reasons, the I.Q. (or index) is disguised in recording it on the cumulative-record folder,

Achievement figures in the fundamental subjects of reading, arithmetic, language, and spelling, when reported in grade placements to students, do have meaning, and these are compared with the student's own capacity to learn and are explained to him in this manner so that he will be motivated to better achievement, if such is the case. The student is always urged to compete with his own record and not that of another. Results of other tests, such as personality or occupational-interest inventories, are reported carefully to counselees in terms of percentile ratings so that they have a clear understanding of these test results and their meaning.

SUMMARY

For some time, Whittier Union High School has felt the need for a cumulative-record folder that could be functionalized so that the recorded information would be more readily available to all teachers. To do this, it was discovered that a development of a professional attitude of teachers toward guidance data was a requisite to effective use. On this fundamental concept, then, was developed a program of professional study to the end that guidance data would have real meanings that could be relayed to students in individual guidance.

To facilitate matters, four grade counselors, one each for freshman, sophomore, junior, and senior classes, have been appointed and given two periods daily for counseling students and giving assistance to teachers.

Each Basic Course teacher is given two double-period classes and one single class in some closely allied work. This plan allows them one daily period for studying and analyzing cumulative-record data, test interpretation, and individual student guidance.

Teachers other than Basic Course teachers are urged to study the cumulative-record folders and are assisted by the superintendent in in-service study groups to understand, interpret, and use professionally the information disclosed.

Parents, community, employers, and students are provided with opportunities to learn and understand the cumulative-record folder and to know more about the interpretation of its information. An office routine has been devised for keeping track of records temporarily out of the file.

Checking results has been done by analyzing changes and improvements in student attitudes, by noticing decrease in discipline problems, by becoming aware of greater happiness and satisfaction on the part of the teachers, and by discovering better co-operation among students, parents, employers, and community leaders.

RECENT REFERENCES REGARDING CUMULATIVE RECORDS:

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b. Dunsmoor and Miller. *Guidance Methods for Teachers.* International Textbook Press. 1942.

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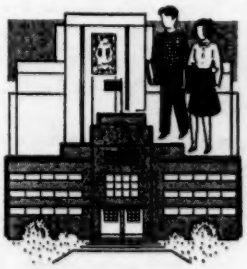

Using Scientific Aids to Instruction

". . . In looking to the future, three general guides appear to be of particular importance in dealing with all scientific aids to instruction. First, every aid should be selected and used in terms of a general curriculum plan which utilizes all types of materials and activities in relationship to achievement of all the desired educational purposes. Second, every aid should be tested in terms of its actual influence on instruction, all other criteria being recognized as secondary. Third, aids should be so administered as to facilitate flexible use rather than uniformity of practice. If these guides are followed, it is my belief that many harmful practices of the past will be corrected and that new and improved practices will be developed in the future."—HOLLIS L. CASWELL, *Director, Division of Instruction, Teachers College, Columbia University,* in TEACHERS COLLEGE RECORD, March, 1946, pp. 361.

FALL MEETING OF HIGH SCHOOL-JUNIOR COLLEGE COMMITTEE ON RELATIONS

University of California, Berkeley
November 7, 1947

THE PROBLEM: A follow-up study of high-school and junior-college graduates to determine their economic and educational problems in the new postwar days.

SOME RECOMMENDATIONS:

1. That the High School and Junior College State Associations, in co-operation with the State Department of Education, establish a pattern to be used by any school wishing to make a follow-up study. Preference is here expressed for a stream-lined questionnaire emphasizing:
   a. What kinds of position are the graduates of the college holding?
   b. Are these positions related to the program of studies completed at the college?
2. That the State Department of Education provide one or more staff members available on call to a school for giving the over-all supervisory and administrative guidance essential for securing adequate returns from any follow-up study.
3. That any or all completed studies resulting from action under Items 1 and 2 be made immediately available to all schools of the State.
4. That no specific occupational-training program provided by a school be allowed to operate in a vacuum. A lay advisory committee for each occupational field is an essential aid in accomplishing this aim.
5. That we encourage manufacturers and distributors of equipment to develop rental plans for schools to replace purchase plans, thus keeping up-to-date at all times the equipment used in training students. Schools should be encouraged to make use of this rental plan.
6. That we give renewed emphasis to, and public interpretation of, one of the major functions of the junior college—namely, that of providing continuing and refresher education for "oldsters," as well as youngsters. The Educational Policies Commission of the National Education Association, in its report on Education for *All* American Youth, describes a group of students to be served as follows:

   > "This group is composed of adults and older youths, mostly employed, who no longer attend school full time, but wish to continue their education during their free hours. Their interests are wide and varied. Some spring from their daily work, some from their home life, some from their civic activities, some from their uses of leisure time, and some simply from the desire to keep on growing."

7. That curricular offerings, particularly in the junior college, utilize promptly and effectively the findings of any follow-up studies defining community, regional, and state long-time trends.
8. That there be incorporated in every training program, especially in the terminal type in the junior college, job experience through some form of the co-operative training plan. Administrators and superintendents should make adequate provisions for the time and the costs of such a program.
9. That principals, presidents, and superintendents in regional areas of the State ally themselves as a visitation workshop and make field trips to business, industrial, and civic plants to experience a close-up view of the employment world in which we live.
10. That trainees admitted to occupational curricula be selected on the basis of aptitudes, abilities, and motivations.
11. That this conference endorse and set up these necessary follow-through procedures: (See the "Recommendations for Action" on pp. 12-14 of the "Report of San Luis Obispo Conference on Vocational Education in the Junior College, August 18-19, 1947.")
    a. "This report be presented to the regional meetings of the California Junior College Association for consideration and reaction.

b. This report be presented to the state meetings of the California Junior College Association and the Association of Adult Education Administrators for consideration and adoption.

c. The Department of Education, the California Junior College Association, and the California Association of Adult Education Administrators jointly sponsor during the year 1947-1948 at least six workshops on vocational education in the junior college, the following to be characteristics of such workshops:

(1) One workshop to be held in each of six specified geographical sections.

(2) Each workshop to be held at one of the participating junior colleges, upon invitation of that junior college.

(3) That there be in attendance the following:

(a) At least the administrator and one other representative of each junior college.

(b) A member of the Department of Education representing secondary education.

(c) A member of the Department of Education representing vocational education.

(d) Several high-school administrators.

(e) At least one representative of each County Superintendent's office concerned.

(4) The agenda for such workshops to include as many items as possible:

(a) Description of at least one program in each field of vocational education, including the initial development, history of enrollment, progress of students, records of graduates, difficulties encountered, evaluation of strong points and weaknesses, and other factors.

(b) Description of a functioning advisory committee in the area, including background, accomplishments, and difficulties.

(c) Description of a survey conducted by one of the participating junior colleges.

(d) Description of a successful guidance program.

(e) Opportunity for small groups to meet and work on common problems, under appropriate leadership selected from those in attendance.

(f) General discussion regarding the need for further meetings and additional steps.

(5) The proceedings of such workshops be recorded and made available to all workshop members and to the members of the Steering Committee."—Rosco C. Ingalls, *Director, East Los Angeles Junior College.*

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California State Teachers College Project in Intercultural Education

The Pacific Coast Council on Intercultural Education, in co-operation with the California State Department of Public Instruction and the seven California State Teachers Colleges, has embarked on a three-year program in pre-service teacher-training. The primary purpose of the project is to prepare teachers to deal effectively with racial and cultural problems which they will encounter in their classrooms and in the communities where they will teach. In addition, the program is designed to evaluate the place of intercultural education in teacher-training and to test experimentally various methods of introducing appropriate learning experiences and subject-matter into teacher-college curricula. William E. Vickery, who did his doctoral work at the Harvard Graduate School of Education and who is co-author with Stewart G. Cole of *Intercultural Education in American Schools,* will be in charge of the work.

Academic Preparation of Junior-College Personnel

By M. E. MUSHLITZ

As part of his work in the State Department of Education, M. E. Mushlitz, Assistant Chief, Division of Secondary Education, is making surveys to determine the need for new junior colleges. Because his findings should prove helpful to all junior colleges in the State, the JOURNAL presented his summary of junior-college subject trends in the October issue. In this issue, Mr. Mushlitz summarizes his findings concerning the status of junior-college certificated personnel—their training and their teaching assignments.

A complete list of institutions from which advanced degrees were granted to instructors in the California public junior colleges, together with the number of doctors' and masters' degrees granted by each institution, is available from the author of this article. A listing of some deviations in teaching assignments from major and minor preparation is also available.

AS junior colleges fulfill their major functions in the development of the enlightened behavior of citizens, young and old, the responsibilities of those who select and hire the teaching staff is paramount. Granted that neither the number of degrees nor the amount of semester hours of training are the only criteria for good teaching, and that teacher-preparation in different colleges and universitites may vary in quality and intensity, these are nonetheless strong indications of professional growth in the art of teaching. So, there is also probably some merit in the belief that one needs to explore a subject-matter field to its depth in order to view it in synthesis with all learning and its ultimate effects upon behavior.

In studying the records of preparation of the certificated personnel who teach in the California public day junior colleges, we become aware of the fact that this very large group of men and women have spent much time and effort in order to professionalize their jobs and to prepare themselves as leaders in this important segment of secondary education. These professional educators have pursued their advanced studies in colleges and universities in practically every section of the United States and in several foreign countries. This lure for graduate work in higher education is evident in the personnel records of every public junior college in California, as indicated by the fact that of the 1,884 certificated employees in these institutions during the 1946-47 school year who were teaching full- or part-time in the day school, 1,692 had advanced degrees; 1,452 were masters; and 240 had been granted doctorates. A large number of those whose highest degrees were masters were well along toward the doctorate. Thus, approximately 90 per cent of all instructors in full- or part-time teaching positions held advanced degrees, and over 12 per cent had been granted doctorates.

If the feeling of security is an important factor in the learning process and in the development of desired behavior on the part of the student, it is

also important to the instructor in his knowledge of the field to which he is assigned to teach. Security in feeling prepared for the work of the classroom is of great importance to those who instruct.

A study of instructional assignments of these teachers reveals that the administration has to a great extent been aware of, and has acted upon, this premise. This situation is strikingly borne out by the facts. Of those 1,452 teachers whose highest advanced degrees were that of masters, 1,049 were teaching only in their majors, 108 had classes that called for instruction in just their minors, and 182 were teaching in classes that combined both majors and minors. Also, 29 were teaching in their majors plus one other subject, and 23 were assigned to classes in their majors plus two or more other subjects. At the same time, 7 were teaching in their minors plus one other, and 6 were instructing in their minors plus two or more other classes not in their majors or minors. There were 15 teaching in their majors and minors plus two or more outside subjects. In considering all of them, only 33 were giving instruction outside their majors and minors.

LIKEWISE, of those 240 instructors who held the doctorate degree, 168 were teaching entirely in their majors, 12 were giving instructions entirely in their minors, and 45 were instructing in their majors and minors only. Also, 7 were instructing in their majors plus one other subject, and only 1 was teaching in his major plus two or more others. Five teachers were working in their minor field plus two or more others, and only 2 were teaching entirely outside their major or minor preparation.

By way of summary then, 1,339 of the 1,452 instructors holding a master's degree were teaching either entirely within the major or minor field of their preparation or in both. Also, 225 of the 240 instructors who held the doctorate degree were teaching either entirely within the major or minor fields of their preparation or both. There were 35 holding advanced degrees who were spending their entire time teaching subjects outside their majors and minors.

From the data cited above, one may assume that junior-college administrators are selecting faculties that are well-trained and have assigned them to the teaching fields in which they excel. Some noteworthy exceptions are implied in the class assignments of those instructors whose work is entirely or partially outside their fields of preparation. However, practical or vocational background, teacher avocation, and personality adjustment all enter into the web of instructional assignments. Also, difficulties in master-programming, especially in the smaller schools often cause irregularities in assignments. The varying vocational, avocational, and personality differences among faculties may provide a logical basis for these irregularities in assignments. Possibly, the instructors concerned may have had such a broad general education that for them the lines of subject fields have disappeared. If the latter is the case, then the ideal might well be to make the irregular the commonplace and thus get away from fragmentation of the curriculum.

THOSE who had majors or minors in English or social studies appeared to have strayed the furthest from home. For example, 14 English majors have been assigned outside their field. Here, one instructor having a master's degree, a major in English and a minor in history, spent his entire day teaching mathematics and drawing. Another English major with a social-studies minor had his entire assignment in the field

of commerce. Also, a major in English with a minor in commerce was assigned full-time in the physical sciences. Strangely enough, four full-time physical-education teachers had their majors and minors entirely outside this area of instruction. One instructor with a major in chemistry and a minor in sociology taught one class in art and one in English. Six instructors were teaching one or more classes in commerce who had neither major nor minor in that field.

IN those highly-specialized areas such as the sciences, foreign languages, and music, the teaching assignments followed closely the professional preparation of the instructor. As stated previously, irregularity in assignments is the exception; most junior-college instructors with advanced degrees are assigned to the fields of their competency.

The geographical location of an institution of higher learning is often a determining factor in the placement of its graduates in a given locale. Administrative likes and dislikes with respect to certain institutions also have influence in the placement of teachers. Then, there is the alma-mater draw. Added to these items are such influences as prestige, kinds of specialized training needed and furnished, and the great advantage of local universities and colleges that offer training for specific credentials. Thus, for this list of junior-college teachers holding advanced degrees, 12 institutions in California granted the master's degree to 996 of them, and 5 of these universities granted doctorates to 154. Three of these major universities granted 846 of the master's degrees and 149 of the doctorates held by these junior-college instructors; these 3 are the University of California at Berkeley, the University of Southern California, and Stanford University.

TABLE I—CALIFORNIA INSTITUTIONS OF HIGHER LEARNING GRANTING ADVANCED DEGREES TO CALIFORNIA JUNIOR-COLLEGE INSTRUCTORS

Name of Institution	Master's Degree	Doctor's Degree
California Institute of Technology	9	2
Claremont Graduate School	37	0
College of the Pacific	25	0
Mills College	9	0
Occidental College	16	0
St. Mary's College	1	0
Stanford University	142	46
University of California (Berkeley)	316	66
University of California (Los Angeles)	47	1
University of Redlands	4	0
University of Southern California	388	39
Whittier College	2	0
Total	996	154

THE migrations of people, the influence of geography, the lure of opportunity in California, and the drawing power of prestige of "name" universities were undoubtedly among some factors causing a number of instructors to have their advanced work done in institutions from out of the state. Teachers College, Columbia University, still wields its influence upon education in the California public junior colleges—in view of the fact that 69 of these instructors with master's degrees and 12 with doctorates come from this institu-

TABLE II—TEN OUT-OF-STATE INSTITUTIONS GRANTING HIGHER DEGREES TO CALIFORNIA PUBLIC JUNIOR-COLLEGE INSTRUCTORS

Name of Institution	Master's Degree	Doctor's Degree
University of Chicago	16	11
Columbia University	69	12
Harvard University	14	13
University of Illinois	14	2
University of Iowa	14	3
University of Michigan	15	0
Northwestern University	18	0
Oregon State College	15	1
University of Oregon	15	1
University of Washington	27	4
Total	217	47

tion. Those 10 universities and colleges which constitute the major out-of-state sources of California junior-college teachers furnished 217 of the instructors with master's degrees and 47 of those holding the doctorate.

To live in a culture, to bask in its lore, and to use its means of communications both oral and written as a part of that living community is the essence of a real education in a modern foreign language. For such experience, 15 junior-college instructors traveled to Europe or migrated from that area, and 9 institutions in 6 foreign countries granted 13 doctorates and 2 master's degrees. These were:

TABLE III—NUMBER OF CALIFORNIA JUNIOR-COLLEGE INSTRUCTORS WHO OBTAINED FOREIGN DEGREES

Name of Institution	Doctor's Degree	Master's Degree
University of Basel	1	0
University of Edinburgh	0	1
University of Innsbruck	1	0
University of Marburg	1	0
University of Munich	1	0
University of Paris	4	1
University of Rome	2	0
University of Vienna	2	0
University of Westphalia	1	0
Total	13	2

With the exception of the graduate of the University of Edinburgh, all instructors from these institutions are teaching foreign languages. It is noteworthy that only one advanced degree was found that was granted from a Spanish-speaking country. This was a master's degree from the National University of Mexico. This is the more surprising, for Spanish is the most popular modern foreign language.

IN CONCLUSION, it may be said that the instructors in the California public junior colleges have had excellent preparation and that those with advanced degrees at least, are, with few exceptions, assigned to those fields in which they excel. California teacher-preparation institutions granted advanced degrees to a vast majority of these teachers, but these instructors in total have done their advanced work in 115 different universities and colleges that represent practically every section of the United States plus 7 foreign countries. This geographical and cultural spread in preparation is a healthy antidote to inbreeding in teacher-education.

Publications for Social-Studies Teachers

The National Council for the Social Studies, which is an NEA department, has just published its seventeenth yearbook entitled *The Study and Teaching of American History*. This 442-page book covers a wide range of topics, such as the function of American history in one world; newer interpretations; related subjects; vertical articulation; methods, materials, and resources; tests; and teachers and their preparation. The first printing of this volume consisted of 8,500 copies. Members of the department have received 4,500 of these copies; the remainder are available to nonmembers at $2.00 (in paper) and $2.50 (in cloth) with the usual NEA discounts for quantity orders.

Teaching Current Events, a 32-page booklet published by American Education Press, Inc., is a presentation of suggestions for increasing students' interest in current events. These include the single-topic, survey, continuing-unit, discussion, and integrated approaches.

Accreditation of Schools In California

By HARRISON M. KARR

In reporting findings in current studies of the problems in secondary education, the JOURNAL announces a series of articles on accreditation in California. As the first in this series, Harrison M. Karr, Associate Director of Relations with Schools, University of California at Los Angeles, contributes this article. In it, Dr. Karr gives the background for the present interest in and activity centered around this pressing issue in California secondary education. He also brings the readers up-to-date on recent studies made on accreditation in this state. Succeeding articles dealing with this topic will present the advantages and disadvantages of accreditation as discussed by educators in California.

CALIFORNIA schoolmen at last have come to grips with the problem of school accreditation. For years, the subject has been under discussion. In fact, for a long time, in almost all school meetings, there has been some consideration of the question of accreditation; but the discussions have been decentralized. Not in years, prior to the present activity, had there been a concerted effort to learn the major sentiment of the schoolmen and to do something about it. But that period has passed. Now, opinion is being determined, and there is every indication that action is to be taken. The reasons for the agitation have been many and varied. But perhaps the following have been predominant:

The High-School Administrators. Many high-school principals have felt that, because of the University's policy of basing accreditation upon the college-preparatory function of the school, general education is being neglected. While the administrators have recognized this as an important phase of the high-school program and one that should not be neglected, they have, at the same time, doubted the wisdom of judging the schools' right to accreditation solely upon that basis.

The Four-Year Colleges. Although the accreditation needs for the larger universities and colleges have been taken care of fairly well by membership in the Association of American Universities, the needs of the smaller colleges have not been met. This last is evidenced by the fact that of the thirty-one four-year colleges in California, eighteen have turned to the Northwest Association of Secondary and Higher Institutions for accreditation. This is indeed an anomalous situation, for California is not officially within the territory covered by the Northwest Association.

The Junior Colleges. Here is the field where the need has been felt most keenly. Again and again, the junior colleges have encountered difficulties in their dealings with other institutions throughout the nation because of the lack of formal accreditation. While the universities and the junior colleges have a working agreement providing for the transfer of scholastic records from junior colleges to the University, and while the State Department lays down certain minimum standards which must be met in order to secure State funds, never-

theless there has been no agency to give official accreditation.

It was this lack of formal accreditation of the junior colleges which acted as the catalytic agent to precipitate the present activity. During the war, when the government was making contracts with colleges for the training of Army and Navy units, California junior colleges were passed by. They were "not accredited institutions." This emergency was surmounted by the quick action of President Sproul, State Superintendent Dexter, and Dr. Osuna, then president of the Junior College Association. These gentlemen were able to convince the Washington officials that California junior colleges were creditable institutions, even though not officially accredited. Although that immediate problem was solved, a great many of the junior-college administrators felt that now was the time to solve the problem on a more permanent basis. They felt that it is wiser to keep the patient well than to try to bring him back to health after he has become ill. Hence, the movement for united action upon the whole question of accreditation.

THE problem was presented to the California Committee for the Study of Education. And that committee appointed a subcommittee consisting of Basil Peterson (Chairman), Marion McCart, Father O'Dowd, and Harrison Karr, instructing them to survey the whole field of accreditation in order to learn what other states were doing, to secure the reaction of administrators throughout the nation toward accreditation, and to determine the specific needs of California. This subcommittee was set up in the spring of 1945 and has been actively studying the question from then until this fall.

The procedure employed by the subcommittee was as follows: Brother Lambert, a graduate student at Berkeley, was commissioned to survey the national field with respect to high schools. Jules Fraden, also a graduate student at Berkeley, was given the task of finding out about the junior colleges. Kyle Esgate, a graduate student on the Los Angeles campus of the University, was directed to make a similar survey with respect to four-year colleges. All of these men were mature persons and experienced teachers, as well as advanced students. Their projects, which were parts of their thesis activities, were supervised by committees of professors on the respective campuses of the University.

The studies conducted by these gentlemen were supplemented by a survey made by the subcommittee itself, during which a questionnaire was sent to all of the high-school principals of California in an effort to learn what, in their opinion, were the accreditation needs of the State.

The material collected was voluminous. Even the briefest type of summary would be impossible within the limitations of this article. Certain factors, however, have an important bearing upon the recommendations of the committee. Among these were the following: All of the three researchers found that the majority of school administrators over the nation believed in school accreditation. All found that the majority of administrators were convinced that there were many more desirable features of accreditation than undesirable ones. Typical of the findings was that by Mr. Fraden to the effect that 90 per cent of the junior-college administrators in the country (and 87 per cent of them in California) believed that there are more benefits than detriments in accreditation. In the subcommittee's own survey, the members found that an overwhelming majority of California high-school ad-

ministrators believe that there is need for additional accreditation procedures in the State. However, in regard to the question: How can we meet this need? they were far from agreement. The majority did not favor joining an established regional association, they did not favor the establishment of an accrediting agency of our own within the State, nor did they agree upon any other solution to the problem.

BASED upon the findings of the researchers, supplemented by its own judgment, the subcommittee recommended that there was a need for additional accreditation procedures within the State. Like the high-school principals, the members of the subcommittee had different opinions as to what these procedures should be. The majority, however, felt that the needs could best be met by the formation of a California accrediting association. They recommended that this association should have representation from all of the educational groups within the State, including the State Department of Education, the University, the junior-college administrators, the high-school administrators, the state-college administrators, and the private-school and college administrators.

Following the subcommittee's report to the California Committee for the Study of Education, several conferences were held to discuss the subcommittee's recommendations. The first of these conferences was assembled at the invitation of the California Committee. About 150 educators from all levels of education were invited to meet at Sacramento on September 30. The net result of the discussions at this meeting was to refer the subcommittee's recommendations back to the various educational groups for further consideration. The California Committee requested each of these educational groups to discuss the recommendations within its own organization and to make its wishes known to the California Committee.

SUBSEQUENTLY, the Representative Council of the California Association of Secondary School Administrators, in their meeting at Sacramento on October 24 and 25, continued the deliberations. After prolonged discussion, they made official recognition of the University's right to its admission pattern of subjects, and to its right to maintain a list of accredited schools for University admission purposes. They expressed a desire, however, for the continuation of the University-High School Affiliation Committee by which means they are enabled to discuss the admission pattern with the University. They recommended, also, that the California Committee set up another subcommittee to study the whole problem of college admissions. Another action of the Representative Council was to provide for the setting up of a committee of high-school administrators to work with the State Department of Education to "upgrade, improve, evaluate, and recognize the general-education programs of the schools."

At the Junior College Association meeting in Bakersfield on November 14 and 15, the recommendations of the subcommittee were discussed, and the group arrived at the following conclusions:

"A committee should be appointed to confer with Superintendent Simpson of the State Department in order to establish a commission to provide for the accreditation of junior colleges."

At a meeting in Los Angeles on October 31, the members of the University Board of Admissions and Relations with Schools passed the following resolutions:

"The University is primarily interested in accreditation for the purpose of determining the ability of the graduates of the school to

pursue successfully the various curricula offered in the University. Certainly one of the high schools' important obligations, and one that is recognized by law, is to offer, for those of its students who desire it, a preparation for further educational opportunities in institutions of higher learning.

"The accreditation program of the University of California seeks to determine the schools' ability to perform this function. It does so by measuring the success of the schools' graduates in the University. In cases where too few attend the University, it solicits the records from other institutions. Practically every public high school in the State is on the accredited list.

"The University should have no objection to any system of evaluation that the schools might choose to inaugurate for mutual improvement in meeting the needs of their respective communities. In order to make its own admission program function, however, it would wish to continue its practice of maintaining a list of secondary schools whose graduates, after admission, on the basis of high school grades received in their respective schools, were able to maintain a satisfactory standing in the University.

"The University has no desire to have its own accredited list of secondary schools considered as an official evaluation of the State's secondary schools, particularly if the inference is created that it involves factors other than those relating to the prognosis of success in the University."

AT the present writing, therefore, these facts are evident:

1. The majority of California school administrators *do not* desire to join any established *regional* accrediting agency.

2. They *do not* desire to set up any California accrediting association comparable to a regional accrediting association.

3. They *do* desire the University to continue its policy of accrediting schools for University admission purposes.

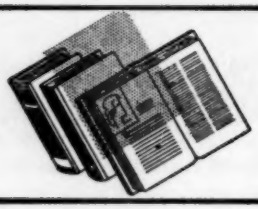
4. They *do* wish to work with the State Department to evaluate and recognize the general-education programs of the schools.

Library of Congress Distributes Textbooks to Veterans

The Library of Congress has virtually completed the distribution to veterans in colleges and universities of a million surplus textbooks obtained by Veterans Administration from the Army and Navy special training programs, VA reports. All but 130,000 of the million college texts have been given to veterans through institutions.

The Library also has distributed about 750,000 of the 1,600,000 United States Armed Forces Institute textbooks, mostly paperbound, which were declared surplus by the Army. Some of these have gone to veterans in colleges, high schools, and trade schools; and others have gone to veterans who are studying special courses while they are patients in VA hospitals.

Distribution of the surplus books already has saved VA approximately $4,000,000, which it would have had to spend to reimburse schools for buying the same books for veteran-students. Most of the saving has come in the books obtained from the Army Specialized Training Program and Navy V-12 College Training Program, because most of these are standard clothbound texts and would have cost VA $3.00 or $4.00 a book.



Book Reviews

Reviewed by HILDA C. KOZMAN

BODY MECHANICS IN NURSING ARTS. *By Bernice Fash.* New York: McGraw-Hill Book Company, 1946. Pp. 130.

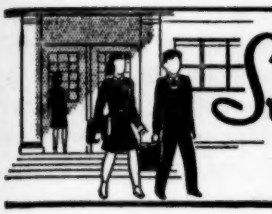
THIS is a learn-by-doing manual for student nurses, of use to any one else who wishes to get the feel of the right and the wrong way to perform everyday tasks involving lifting, carrying, pushing, pulling, stooping, reaching, and the like. Both the drawings and the text emphasize body poise and balance in terms of dynamic and efficient movement rather than the more static concept of "posture" common to older texts on this subject. As stated on the jacket of the book, "Basic laws of physics are utilized in a nontechnical manner and may be practically applied to physical activities. . . ."

The manual is divided into three parts: Section 1 — Introduction to Body Mechanics; Section 2—Body Mechanics in Nursing; Section 3—Introduction to Body Mechanics in Business and Industry. The meat of the book is in the first section, which describes a series of self-tests accompanied by diagrammatic illustrations showing how to perform them. For each test, directions are given the performer for moving incorrectly and correctly so that she feels the difference in the amount of muscle fatigue and strain resulting from the movements. Principles of movement for minimum strain with maximum efficiency, as determined by each test, are stated. These statements are models of simplicity and clarity. "The more lean, the more work" and "Lift close to the body" are examples.

In the last two sections, the principles revealed in the self-tests are applied to the tasks performed by nurses, office workers, and plant employees. The application to nurses' routine jobs is most fully developed. "A preventive program is presented to help the nurse become more efficient in physical skills, avoid fatigue, remove muscular stress and strain and prevent the development of postural defects." One chapter in Section 3 is devoted to discussing learning to relax while on the job. A work outline is presented, based on Jacobson's books, *Progressive Relaxation* and *You Must Relax.*

Teachers of physical education, who are uniquely concerned with the subject of body mechanics, will find practical suggestions in this book for helping boys and girls use their bodies more effectively in everyday tasks. Teachers in other fields, such as shops, home economics, commercial subjects, and dramatics, will find it useful also, for they are aware of their students' need to improve specific movement patterns related to their subject fields. However, the material is not in a form particularly suited to adolescents' use as a textbook. The learn-by-doing through the self-tests will probably be better accomplished through the use the teacher makes of the manual. (A parallel treatment of body mechanics with high-school girls and boys in mind as the self-testers would be a still more valuable teaching aid than this book.)

Hilda C. Kozman, Ph.D., is co-author of "Physical Fitness for Girls," published in 1943 by Barnes Publishing Company, and "Counseling Girls in a Changing Society," published in 1947.



Secondary Sketches

Edited by EVERETT V. O'ROURKE

Building Orange Coast Junior College.—After completing a survey, the California State Board of Education recommended on September 25, 1946, that an election be held so that the voters of the Orange Coast area might determine whether a local junior-college district should be formed. At the subsequent election, an overwhelming majority of the voters decided to establish a college. Therefore, the Board of Trustees of the district and the administrative officers face two immediate tasks—that of securing and equipping an adequate college campus with buildings and that of organizing an educational program.

Application has been made to the War Assets Administration for a portion of the Santa Ana Army Air Base located near Costa Mesa. The application has been received by WAA, and it is anticipated that in the very near future Orange Coast Junior College will be allotted 243 acres of land and 70 buildings. The requested land and buildings, with some alterations, will provide adequate temporary facilities for a complete college plant.

The new junior-college district is comprised of seven elementary districts, Huntington Beach Union High School district, and Newport Harbor Union High School district. The assessed valuation of this area in 1946-47 was 88 million dollars.

Orange Coast Junior College will begin a complete and regular instructional program in September, 1948, designed to meet the post-high-school needs of the people of the area. In order to build a sound educational program, a comprehensive survey of educational and vocational needs of Orange County is being made. This survey is a co-operative venture of the junior colleges of the county (Fullerton, Santa Ana, and Orange Coast), the office of Orange County Superintendent of Schools, and the State Department of Education. The educational offerings of Orange Coast Junior College will be determined after the results of this survey have been presented to a representative over-all citizens' committee, the Board of Trustees, and the college administrators. A limited instructional program, designed to meet the needs of veterans and others, may be offered as early as February, 1948. Every effort will be made to provide training for all students in vocational competency, personal adequacy, and civic competency. Terminal education geared to the Orange Coast region will be emphasized.

It is anticipated that Orange Coast Junior College will begin with an enrollment of 500 to 700 in the fall of 1948. With a predicted population increase in the district of 100 per cent within five or six years, the enrollment of the College will probably grow to 1500 or 2000 in a relatively short period of time.

Co-operative Curriculum Planning at the County Level.—As an outgrowth of curriculum work being carried on in Modoc County under the direction of Hallie M. Tierney, County Superintendent, a county-wide curriculum council of school administrators and teachers has been functioning for the past several years. The Council is composed of three elementary principals, three secondary principals, three faculty representatives from each level, and the county-office staff. Membership is on a rotating basis, with partial replacement of personnel each year.

The Council acts as the directing body for general over-all planning and policy-making. Members of the Council have assumed responsibility in planning for institute and group faculty meetings. Under their direction, courses of study have been developed by teacher-committees and materials made available to the schools of the county. A comprehensive achievement-testing program at both elementary and secondary levels has been carried on for the past two years, and the results have been used as a partial basis for curriculum work. Many problems affecting individual schools, as well as all schools in the county, have been discussed and solutions suggested by the Council. An important feature of the group is their stress on the fact that effective planning requires a two-way process of co-operation between county-office and school personnel. A direct result of the work of the body is better understanding of common educational problems and a concerted attack upon them in terms of a twelve-year program.

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